The Journal of Occupational Diseases and Traumatic Surgery

Industrial Medicine

for

Physicians and Surgeons in Industry

Volume 9 JULY, 1940 Number 7

THIS ISSUE

Effort and Trauma
—The Relation to Acute Coronary Occlusion—

The Industrial Back Case
—The Problem—

Acute Suppurative Arthritis
—A Simple Method for Treatment—

Southern Railway Surgeons
—Forty-Third Annual Meeting, Charleston, S. C., June 4-6, 1940—

The Knudsen Award
—Acknowledgment by Dr. Leroy U. Gardner, Recipient, 1939-1940—

Medicine and Hygiene
—Abstracts of Papers Presented at the Twenty-Fifth Annual Meeting of the American Association of Industrial Physicians and Surgeons and the First Annual Meeting of the American Industrial Hygiene Association, New York, June 3-6, 1940—

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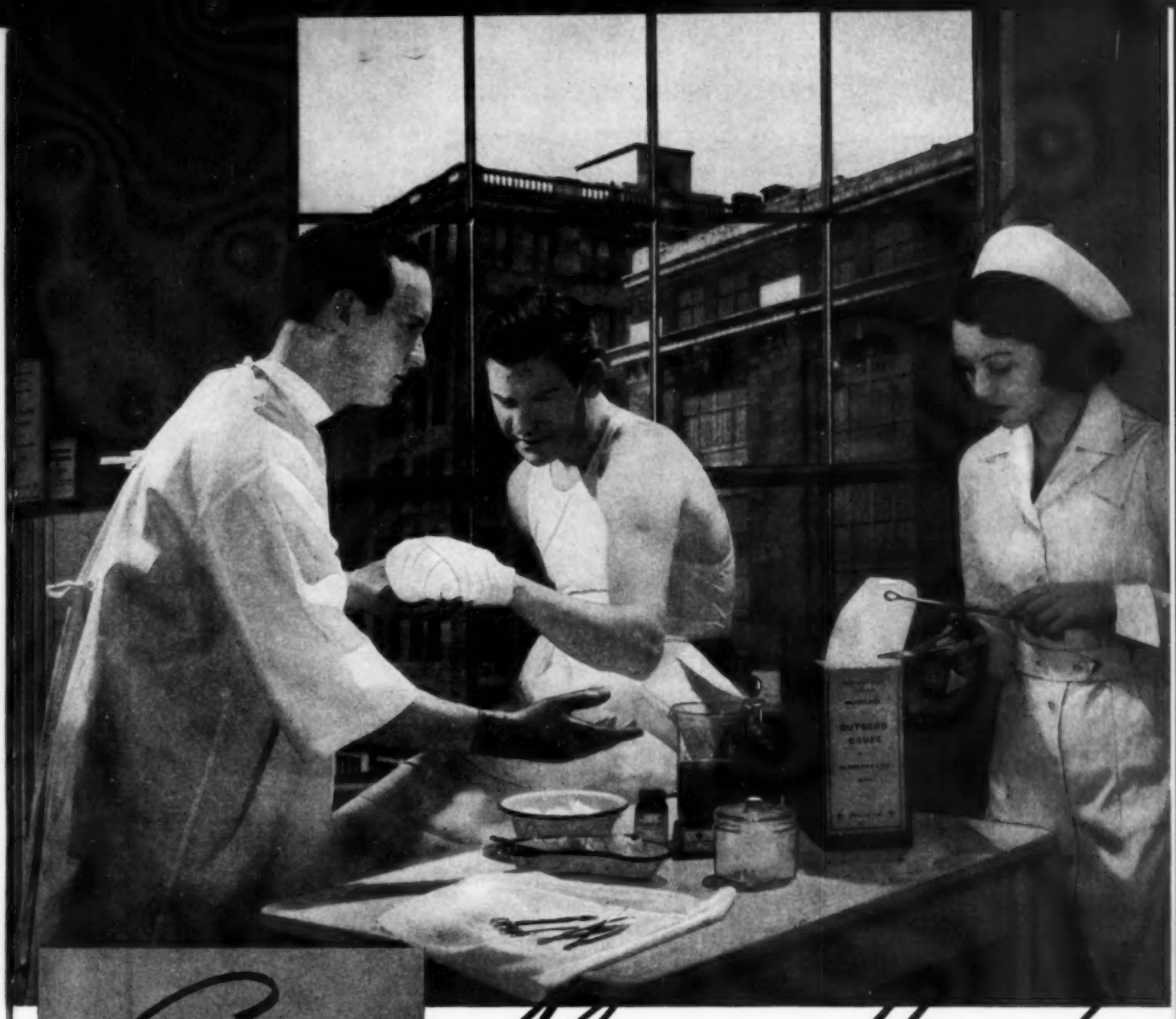

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Industrial Medicine | Volume 9 JULY, 1940 Number 7 | Industrial Medicine

THIS MONTH

MEDICINE and HYGIENE 329
—Abstracts of Papers of the Twenty-Fifth Annual Meeting of the American Association of Industrial Physicians and Surgeons and the First Annual Meeting of the American Industrial Hygiene Association, June 3-6, 1940

AMERICAN INDUSTRIAL HYGIENE ASSOCIATION 331

AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS 341

PRESIDENT'S ADDRESS ..... McIVER WOODY, M.D. 349

THE KNUDSEN AWARD ..... LEROY U. GARDNER, M.D. 351

THE INDUSTRIAL BACK CASE ..... J. HUBER WAGNER, M.D., F.A.C.S. 354

Discussion by WILLIS W. LASHER, M.D., F.A.C.S. 357

EFFORT and TRAUMA ..... ARTHUR M. MASTER, M.D. 359
—The Relation to Acute Coronary Occlusion (With SIMON DACK, M.D., and HARRY L. JAFFE, M.D.)

Discussion by ROBERT L. LEVY, M.D. 363

SOUTHERN RAILWAY SURGEONS 364
—Forty-Third Annual Meeting

ACUTE SUPPURATIVE ARTHRITIS ..... J. PAUL KENT, M.D. 368
—A Simple Method for Treatment

CLINIC on HEALTH in INDUSTRY 370
—Employer and Doctor Confer
(Reported by C. O. SAPPINGTON, M.D., Dr.P.H.)

EDITORIAL:

OUR KIND OF EFFICIENCY 375

INDUSTRIAL HEALTH CLINIC 375

INDUSTRIAL HEALTH and DISEASE:

ORGANIZED MEDICINE AND INDUSTRIAL HEALTH 376
(C. M. PETERSON, M.D., in "Minnesota Medicine")

OCCUPATIONAL DERMATOSES 378
(HARRY R. FOERSTER, M.D., in "Rocky Mountain M. J.")

THE highest standards ever achieved in the history of these organizations." That's the way our Reporter describes the series of addresses and papers presented, at New York last month, at the Twenty-Fifth Annual Meeting of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS and the First Annual Meeting of the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION. His ably written account, abstracting each of the presentations, amply sustains his characterization. "The medical program was replete with important and timely subjects, discussed by authorities in their respective fields. The hygiene program contained much that was new . . . . all of which was of equal interest and importance to both the hygienists and the physicians." The report will be followed here by the publication of most of the papers and discussions. « » DR. WOODY'S Address, page 349, timely, and thoughtfully given, contains a pungent sentence: "Would that we doctors could cure nations duped by delusions of grandeur as often as we can the individual." « » DR. GARDNER'S response to the KNUDSEN AWARD presentation well reflects the quality of the contribution to industrial medicine that won him the honor. « » DR. WAGNER'S "Industrial Back Case," with discussion by DR. LASHER, and DR. MASTER'S "Effort and Trauma in Relation to Acute Coronary Occlusion," discussed by DR. LEVY, are two of the papers from the New York program. « »

—Continued on page 9.

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PATCH, THE E. L. COMPANY 11
ROMAINE PIERSON PUBLISHERS, INC. 9
UPJOHN COMPANY, THE ..... 4th Cover

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—*Continued from page 3.*

FOLLOWING these is the report of the Forty-Third Annual Meeting of the ASSOCIATION OF SURGEONS OF THE SOUTHERN RAILWAY, with one of the papers: that of DR. KENT, on "Acute Suppurative Arthritis," page 368. « » THEN comes DR. SAPPINGTON'S account (page 370) of a meeting at Muskegon, Michigan, which should have far-reaching significance in the future of preventive medicine in industry, the "Clinic on Industrial Health" developed by the Committee on Healthful Working Conditions of the National Association of Manufacturers. In many respects this was a remarkable meeting. Its significances are apparent in the story. So great was the interest, and so popular the idea, that plans are already being made for more meetings of the same kind. Among the highlights—although it seemed that all the talks were highlights—was DR. HEISER'S comment at the Luncheon Session on "One Secret of the German War Machine." DR. HEISER has visited extensively in Germany both before and since Hitler came to power. He stated that "the apparent inexhaustibility of the German war machine is due partly to the carefully planned industrial health program of the Nazi regime." Pointing out that the smashing power of that machine was only possible through physical fitness in the industries supplying material and equipment, he decried the fact that "the regimented health program of Nazi Germany was in reality a fattening of the calf for slaughter." He concluded: "What I do want to stress is that we can with voluntary cooperation of labor, management, medicine, government and the public, accomplish an even greater degree of physical fitness and efficiency in our industrial defense without regimentation."

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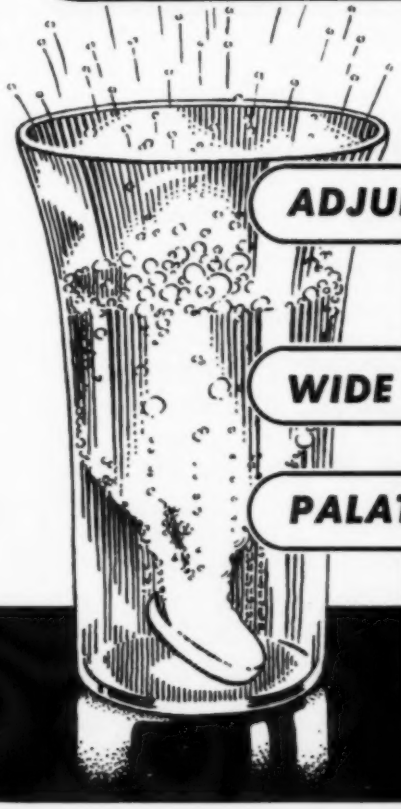

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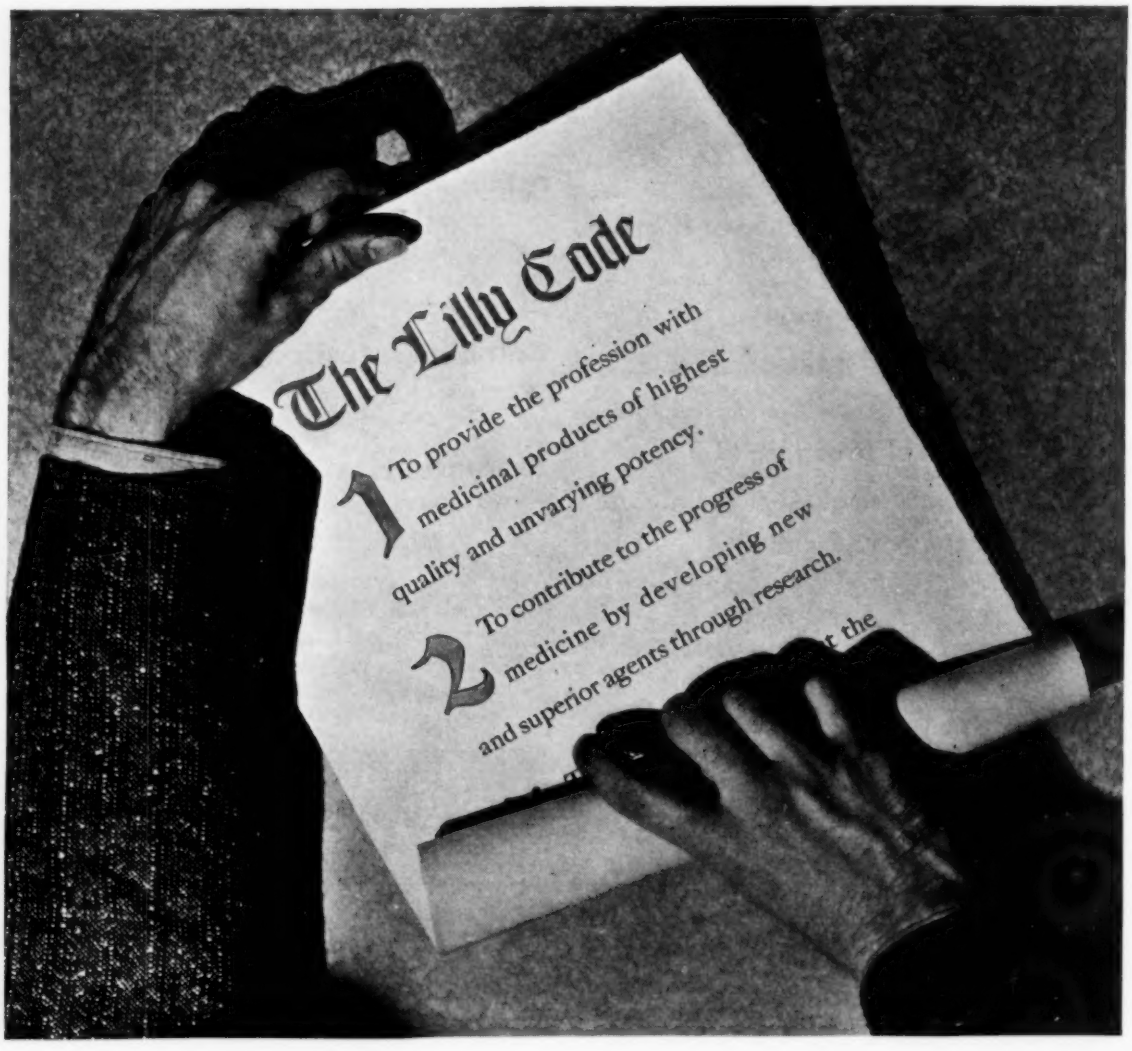
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This magazine is published to promote sound thought upon and concerning industrial medicine and traumatic surgery. To that end it will contain articles, news items, reports, digests, and other presentations, together with editors' comments. The editorial policy is to encourage frank discussion. On this basis contributions are invited.

Industrial Medicine

Reg. U. S. Pat. Off.

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The Journal of Occupational Diseases and Traumatic Surgery

With which are consolidated "The Industrial Doctor" and "International Journal of Medicine and Surgery."

The Science, the Law and the Economics of Industrial Health

Volume 9 JULY, 1940 Number 7

Medicine and Hygiene

—Abstracts of Papers of the Twenty-Fifth Annual Meeting of the American Association of Industrial Physicians and Surgeons and the First Annual Meeting of the American Industrial Hygiene Association, June 3-6, 1940, New York City—

CELEBRATING the Twenty-Fifth anniversary of the founding of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS and the First anniversary of the founding of the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION, the series of addresses and papers presented reached the highest standards ever achieved in the history of these organizations.

The medical program was replete with important and timely subjects, discussed by authorities in their respective fields. The hygiene program contained much that was new, especially with regard to the results of animal experimentation, as well as research along other lines, and also with respect to the introduction of new methods — all of which was of equal interest and importance to both the hygienists and the physicians.

The program of the four-day sessions follows:

Tuesday Morning, June 4

McIVER WOODY, President, AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS, and WILLIAM P. YANT, President, AMERICAN INDUSTRIAL HYGIENE ASSOCIATION, Chairmen of the Session.

Address of Welcome — THE HON. NEWBOLD MORRIS, President, New York City Council.

Response — McIVER WOODY, M.D., President, AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS.

"Industrial Hygiene in Steel Plant Practice" — DONALD E. CUMMINGS, Director, Division of Industrial Hygiene, University of Colorado, Department of Medicine, Denver, Colorado.

"A Preliminary Report of the Effects of the Inhalation of Dust in the Chrome Brick Industry" — W. B. FULTON, F. E. BUTTERS, A. E. GALLOWAY, F. P. KOPPENHAVER, K. R. DOREMUS and R. M. KIRK, Division of Industrial Hygiene, Pennsylvania Department of Health, Harrisburg, Pennsylvania.

"Light and Life — Some Glimpses into the Future" — SAMUEL G. HIBBEN, Director of Applied Lighting, Lamp Division, Westinghouse Electric & Manufacturing Company, Bloomfield, New Jersey.

Tuesday Afternoon

PHILIP DRINKER, Department of Industrial Hygiene, Harvard School of Public Health, Boston, Massachusetts, Chairman of the Session.

"Toxicity of Heat-Converted Films of Urea-Formaldehyde-Ethylene Glycol Resins Taken Orally" — T. S. HODGINS and A. G. HOVEY, Reichhold Chemicals Inc., Detroit, Michigan.

"Exposures to Fume and Noxious Gases under Varied Conditions of Arc Welding Using Uncoated Washed Rods" — G. C. HARROLD, S. F. MEEK and C. P. McCORD, Industrial Hygiene Laboratories, Chrysler Corporation, Detroit, Michigan.

"Field Determinations of Carbon Disulfide in Air" — F. J. VILES, Chemist, Research Laboratory, Liberty Mutual Insurance Company, Boston.

"Comparison of Gas Recorders vs. Routine Sampling for Carbon Disulfide and Hydrogen Sulfide in Air" — G. M. REECE, Department of Industrial Hygiene, Harvard School of Public Health, Boston, and BENJAMIN WHITE, American Viscose Corporation, Lewistown, Pennsylvania.

"Dropping Mercury Electrodes for Lead Analysis-Application to Lead in Air" — E. C. BARNES, Industrial Engineer, Medical Department, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pennsylvania.

"Application to Lead in Urine" — H. CRANSTON, Chicago, Illinois.

"Estimation of Small Amounts of Antimony Using Rhodamine B" — W. G. FREDRICK, Chief Chemist, Bureau of Industrial Hygiene, Detroit Dept. of Health, Detroit, Michigan.

"A Rapid Photometric Method for Determining Micro-quantities of Solvent Vapors in Air" — V. F. HANSON, R. & H. Chemicals Dept., E. I. du Pont de Nemours & Co., Niagara Falls, New York.

"Economy in Exhaust System Design" — T. HATCH, Associate Dust Control Engineer, Division of Industrial Hygiene, New York State Dept. of Labor, New York City.

GENERAL DISCUSSION — Led by H. B. MELLER, Managing Director, Air Hygiene Foundation of America, Inc., Pittsburgh, Pennsylvania.

Tuesday Evening — Dinner Meeting

"Industrial Hygiene and National Defense: From viewpoint of problems of sudden industrial expansion and warfare" —

PHILIP DRINKER, Department of Industrial Hygiene, Harvard School of Public Health, Boston.

CAREY P. MCCORD, M.D., Industrial Hygiene Laboratories, Chrysler Corporation, Detroit.

CHANNING R. DOOLEY, Manager, Industrial Relations, Socony-Vacuum Co., Inc., New York.

AMOS A. FRIES, Brigadier General, U.S.A., Retired, Washington, D. C.

L. S. AYARS, JR., Assistant Manager, Acoustical Department, Celotex Corporation, New York.

Wednesday Morning, June 5

WARREN A. COOK, President-Elect, American Industrial Hygiene Association, Chairman of Session.

"Studies of the Lead Hazard in Printing — Engineering and Chemical Phases" — H. W. RUF, Industrial Hygiene Unit, Wisconsin State Board of Health, Madison, Wisconsin.

"Medical Phases" — E. L. BELKNAP, Medical Consultant, Milwaukee, Wisconsin.

"Lead Exposures as Estimated by Urinary Excretion and Effect of Vitamin C on Exposed Workers" — S. W. MARCHMONT-ROBINSON, Department of Industrial Sanitation, Ford Motor Company.

"Control of Possible Lead Hazards in the Production and Use of Leaded Steels" — EDWIN D. MARTIN, Metallurgist, Inland Steel Co., Indiana Harbor, Indiana.

"Correlation Coefficient Between Basophilic Aggregation Test and Lead in Urine" — S. F. MEEK, G. R. COLLINS and G. C. HARROLD, Industrial Hygiene Laboratories, Chrysler Corp., Detroit, Michigan.

"Experimental Studies on the Ingestion of Lead" — ROBERT A. KEHOE, Director, Kettering Laboratory of Applied Physiology, University of Cincinnati, College of Medicine, Cincinnati, Ohio.

GENERAL DISCUSSION.

Wednesday Afternoon

DONALD E. CUMMINGS, Director, Division of Industrial Hygiene, Department of Medicine, University of Colorado, Denver, Colorado, Chairman of Session.

"Animal Studies on the Toxicity of Antimony" — WM. R. BRADLEY and W. G. FREDRICK, Bureau of Industrial Hygiene, Detroit Department of Health, Detroit, Michigan.

"The Determination and Significance of Carbon Disulfide in Urine and Blood" — A. W. HUNTER, American Viscose Corporation, Marcus Hook, Pennsylvania, and PHILIP DRINKER, Department of Industrial Hygiene, Harvard School of Public Health, Boston.

"Absorption, Distribution and Elimination of Benzene from Body Tissues and Fluids of Dogs Exposed to Benzene Vapor in Air" — H. H. SCHRENK, Chief Chemist, Health Section, Pittsburgh Experiment Station, U. S. Bureau of Mines, Pittsburgh, Pennsylvania.

"The Toxicity of Nitroparaffins and their Derivatives" — WILLARD MACHLE, Assistant Director, Kettering Laboratory of Applied Physiology, University of Cincinnati, College of Medicine, Cincinnati, Ohio.

"The Response of Rabbit Skin to Compounds Reported to have Caused Acneform Dermatitis" — E. M. ADAMS, D. D. IRISH, H. C. SPENCER and V. K. ROWE, Biochemical Research Laboratory, Dow Chemical Company, Midland, Michigan.

"The Significance of Clothing in Air Conditioning Standards" — C. P. YAGLOU, Department of Industrial Hygiene, Harvard School of Public Health, Boston.

"The Effects of Humid Heat on Colored and on White Workmen" — D. B. DILL, Professor of Industrial Physiology, Fatigue Laboratory, Harvard University, Boston.

BUSINESS MEETING:

AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS.

Thursday Morning, June 6

Business, Committee Reports, etc.

"President's Address" — MCIVER WOODY, M.D., President, AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS; Medical Director, Standard Oil Company of New Jersey.

"Pre-employment Physical Examination" — HARRY A. NELSON, Director, Workmen's Compensation Industrial Committee of Wisconsin.

Discussion — J. J. WITTMER, M.D., Director, Personnel Department, Consolidated Edison Company, New York, and VICTOR G. HEISER, M.D., Consultant, National Association of Manufacturers, New York.

"Care and Handling of Traumatic Injuries" — JOHN J. MOORHEAD, M.D., Clinical Professor of Surgery, Columbia Postgraduate Medical School.

Discussion — H. V. SPAULDING, M.D., Surgeon-in-Chief, Broad Street Hospital, New York.

"Back Injuries" — J. HUBER WAGNER, M.D., Chief Surgeon Pittsburgh District, Carnegie-Illinois Steel Corporation.

Discussion — Willis W. Lasher, M.D., Asst. Professor Traumatic Surgery, New York Postgraduate Medical School.

Round Table Luncheons, separately held, on the following subjects:

"New Drug Therapy" — J. M. Carlisle, M.D., Medical Director, Merck and Company.

"Toxicology in Industrial Medicine" — J. H. Foulger, M.D., Director, Haskell Laboratory of Industrial Hygiene.

"Who Can Work: Evaluation of Physical Fitness for the Job" — Michael Lake, M.D., Medical Director, R. H. Macy & Company.

Thursday Afternoon

Chairman, Otto P. Geier, M.D., Cincinnati Milling Machine Co.

"Problems in Diagnosis and Management of the Nucleus Pulposus" — Byron Stookey, M.D., Clinical Professor of Neurological Surgery, Columbia University College of Physicians and Surgeons.

Discussion—E. Jefferson Browder, M.D., Assistant Clinical Professor of Surgery, Long Island College of Medicine.

"Injuries Involving the Elbow Joint" — Philip D. Wilson, M.D., Clinical Professor of Orthopedic Surgery, Columbia University College of Physicians and Surgeons.

Discussion—Joseph B. L'Episcopo, M.D., Clinical Professor of Orthopedic Surgery, Long Island College of Medicine.

"Shoulder Injuries" — William Darrach, M.D., Dean Emeritus and Professor of Clinical Surgery, Columbia University College of Physicians and Surgeons.

Discussion — Clay R. Murray, M.D., Associate Professor of Surgery, Columbia University College of Physicians and Surgeons.

Thursday Evening

Twenty-Fifth Annual Dinner

Toastmaster — McIver Woody, M.D., Medical Director, Standard Oil Company of New Jersey.

Presentation of the William S. Knudsen Award for 1939-1940, by William S. Knudsen, President, General Motors Corporation, Detroit.

Acceptance of the Award, Leroy U. Gardner, Director, Saranac Laboratory for the Study of Tuberculosis, Saranac Lake, New York.

Guest Speaker — Dr. Allen A. Stockdale, D.D., National Association of Manufacturers, New York. Subject — "Humanities and Economics of Safety."

Friday Morning, June 7

Chairman, Edward C. Holmblad, M.D., American Express Co., Chicago.

"Diagnostic Criteria in Lead Poisoning" — Elston L. Belknap, Assistant Clinical Professor of Medicine, Marquette University School of Medicine.

Discussion — Irving Gray, M.D., Attending Physician, Coney Island and Seaview Hospitals, and L. Greenburg, M.D., New York State Dept. of Health.

"Hygiene Aspects of Welding in the U. S. Navy" — Capt. E. W. Brown (MC) U. S. Navy.

Discussion — Emerich von Hoam, M.D., Professor of Pathology, Ohio State University.

"Occupational Dermatitis" — Marion E. Sulzberger, M.D., Assistant Professor Clinical Dermatology and Syphilology, New York Postgraduate Medical School, Columbia University.

Discussion — Louis Schwartz, M.D., Medical Director, National Institute of Health, Washington, D. C.

"Silicosis" — L. E. Hamlin, M.D., Surgeon-in-Charge, Penn Hospital, Norway, Michigan.

Discussion — Leroy U. Gardner, M.D., Director, Saranac Laboratory for the Study of Tuberculosis.

Friday Afternoon

Chairman, McIver Woody, M.D.

Reports of Committees, etc.

"Effort and Trauma in Coronary Occlusion and Insufficiency" — Arthur M. Master, M.D., Associate Physician and Physician-in-Charge Cardiac Clinic, Mount Sinai Hospital, New York.

Discussion — Robert L. Levy, M.D., Associate Physician, Presbyterian Hospital, New York.

"Trauma and the Peripheral Vascular System" — Irving S. Wright, M.D., Associate Professor of Clinical Medicine, Columbia University College of Physicians and Surgeons.

Discussion — Gilbert Marquardt, M.D., Chief, Vascular Clinic, Northwestern University Medical School.

"Shock" — John Scudder, M.D., Presbyterian Hospital.

Discussion — George Morris Piersol, M.D., Medical Director, Bell Telephone Company of Pennsylvania and Dean of Graduate School of Medicine, University of Pennsylvania.

"Bio-physiological Relations of Treatment in Fracture of the Neck of the Femur" — Fred H. Albee, M.D., Orthopedic Surgeon, New York.

Summation — Cassius H. Watson, M.D., Medical Director, American Telephone and Telegraph Company.

American Industrial Hygiene Association

Tuesday Morning, June 4

MR. WILLIAM P. YANT, President of the American Industrial Hygiene Association, acted as chairman of the session and officially welcomed the delegates.

The address of welcome to the City of New York was given by the Hon. Newbold Morris, President of the New York City Council, representing Mayor LaGuardia. Reference was made particularly to

minimum standards of working conditions and the fact that there are a great variety of problems in this area. Allusion was made to the problem of changing the definition of occupational disease. A discussion of democracy and its relationship to healthful conditions in industry was given and it was pointed out that the trend has been upward with relationship to various minimum standards for healthful conditions in industry.

DR. McIVER WOODY, President of the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS responded to the official welcome. There is idealism both in administration of municipal affairs and in medical work in industry. Great advances have been made in the past 25 years in the standards of working conditions, which are typified by our meetings. The times would necessitate conferences like this if we hadn't arranged for such yearly conferences already. It is of particular significance, therefore, that we meet at this time and exchange ideas.

MR. DONALD E. CUMMINGS, presenting the subject "Industrial Hygiene in Steel Plant Practice," likened the steel industry to a giant which is now turning to health insurance and in the examinations for insurance has been discovered to have several maladies, among which were counted (1) fickle temperatures; (2) dust; (3) metal poisons; (4) cutting compounds and cleaning compounds; (5) carbon monoxide, and (6) accidental injuries.

The pneumonia experience of the U. S. Public Health Services was cited and reference was made to the fact that heat exhaustion, heat strokes, and cataracts in furnace workers had been greatly reduced in incidence.

The dusts are mainly of the nuisance type, but some are hazardous particularly those resulting from the handling and processing of gannister, sand and fire clay. There are also certain operations, mainly the cleaning operations, and sand conditioning, that are responsible for the occurrence of hazardous conditions.

Among the metal poisons that are of importance in the steel industry, lead has been recently used in the fabricating of steel. Also encountered are red lead, the handling of scrap lead, and the manufacturing and processing of lead bearings.

From cutting and cleaning compounds, there is the hazard of dermatitis. Also one may encounter benzol being used in cleaning and in processes and in paints.

Carbon monoxide has been found around blast furnaces, and arsine must be considered as a possible hazardous exposure in the process of cleaning and pickling tanks.

In conclusion, it was stated that the job should be placed in skilled hands, namely in departments of industrial hygiene composed of engineering and medical personnel; examinations should be made at periodic intervals, and through the results of such examinations preventive measures which are indicated should be promptly applied.

MR. A. E. GALLOWAY presented "A Preliminary Report of the Effects of the Inhalation of Dust in the Chrome Brick Industry."

In this preliminary report, it was found that the controls in a chromium brick plant offered evidence in two instances which suggested the appearance of pneumoconiosis in two chest x-rays.

Lantern slides were used to show a flow sheet of the various processes and also slides were shown of microscopic components of the various materials. Such materials were chromite, magnesite, kaolin, refractory cement, and olivine which is magnesium silcate.

The average dust determinations in grinding operations showed 371 million particles and an average of 7½% total silica; the average in the mixing and moulding operations showed 177 million particles and 8.8% total silica; the average in kiln operations was 8½ millions of particles with 50% free silica.

In conclusion, it was stated that this work involved exposure to chromite, magnesite and silicates; the range in dust concentration was from eight to 600 million particles per cubic foot of air; the range of total silica was 6 to 12%; and the range of chromium was 25 to 50 gammas per gram.

DR. SAMUEL G. HIBBEN presented a most interesting and comprehensive demonstration of "Light and Life" — Some Glimpses into the Future."

Although it was 30,000 years ago that sources of radiant energy were developed, it has only been three years since it became possible to transpose electrical energy into radiant energy. The varying wave lengths are measured in Angstrom units likened to the keyboard of a piano, the eyes seeing the wave lengths comparable to the position of middle C. A large graph of various types of radiant energy and their locations in the various phases of Angstrom units was used to demonstrate the variations in lengths of two to 20 millions of such units.

We now have available about 6000 types of filament lighting units and a number of these were demonstrated. It was also shown how fluorescent light can be generated when certain chemicals are mixed with ordinary water.

The sodium vapor lamp for the lighting of highways was shown and neon lights of different color were demonstrated, the latter type taking very little current. The stroboscopic effect was demonstrated, which has been applied to the talking movie and also to signalling.

Among recent developments of a decorative interest are luminous cocktail glasses, ashtrays, and similar vessels, and also artificial flowers which glow with luminous effects in color.

Germicidal rays were demonstrated for the sterilization of vessels and the fungicidal effect was also mentioned. The application of these to the treatment of infections and to superficial sterilization was stressed.

The black light (so-called) was demonstrated in the fluorescence of fabrics in color, also as applied

to handrails, buttons, laundry marks, and the like. Plastic yarns, and new developments from which may be woven luminescent fabrics in colored patterns were also shown.

The steam lamp which does not create any light but heats water rather rapidly and which may be used for sterilizing purposes was also demonstrated.

Motion pictures showing the effects of germicidal light on paramoecia provided a very interesting conclusion to an unusual presentation.

Tuesday Afternoon

MR. T. S. HODGINS presented the subject "Toxicity of Heat-Converted Films of Urea-Formaldehyde-Ethylene Glycol Resins Taken Orally."

Industrial uses of urea-formaldehyde-ethylene glycol resins involve plywood adhesives, fabric stiffeners, and in combination with rubber latex, and also in paper-coating compositions which are used for grease-resistant wrappers coming in contact with foods such as butter, lard, meat and other fatty substances. Because of the latter-named uses, it was deemed necessary that toxicity tests be carried out in a manner to demonstrate the amount of material which might be consumed orally.

Tests on guinea pigs in which 100 milligrams of the material were fed in a single relatively massive dose, the guinea pigs being killed and examined 14 days later, showed the material to be nontoxic. This conclusion was based on the gain in weight while being fed, general appearance of animals, and the results of pathological studies following autopsy.

Tests on rats, in which 10 milligrams of the product were fed daily for 30 days, showed at autopsy very little significant toxemia, but upon microscopic studies, showed mild gastro-intestinal irritation, as well as mild effects upon the liver and kidneys.

It is believed, however, that after careful consideration of the above data, especially in view of the nature of the product, as well as the purpose for which it was intended, it can be safely concluded that no toxic effects would result from the use in actual practice.

DR. GORDON C. HARROLD presented the subject "Exposures to Fume and Noxious Gases under Varied Conditions of Arc Welding Using Uncoated Washed Rods."

An investigation was reported upon in which arc welding with bare iron electrodes was carried out in an enclosed chamber of 1000 feet capacity for a period of 20 months. In these experiments, the voltage across the welding arc was varied from 27-44 volts. It was found that with every increase in voltage the quantity of nitrous gases increased. At 44 volts, the overall maximum of nitrous gases in parts per million was 135, although the high average was 96 parts per million. To these gases, experimental animals (rabbits, rats) were exposed continuously for six hours per day, five days per week, for long periods approximately 40 days. At no time was it possible to produce enough nitrous gases to induce any characteristic features of poisoning by the oxides of nitrogen. The investigators concluded that at least for animals, the danger zone for injurious action lies above 70 parts per million of nitrous gases.

MR. F. J. VILES discussed "Field Determinations of Carbon Disulfide in Air."

The most promising methods for the determination of carbon disulfide encountered in the literature were the cupric ethyl xanthate, Hector's base, formaldehyde-plumbite, iodine azide and diethylamine procedures. Of these, the latter was best from the standpoint of rapidity, simplicity, and accuracy.

In adopting the diethylamine test, a known volume of air is allowed to come in contact with an alcoholic-triethanolamine solution of diethylamine and cupric acetate. The carbon disulfide in the air sample is quantitatively absorbed, producing a golden yellow color, the intensity of which is directly proportional to the amount of carbon disulfide present.

The reactions involved are (1) the formation of diethyldithiocarbamic acid from diethylamine and carbon disulfide, and (2) the formation of cupric diethyldithiocarbamate from diethyldithiocarbamic acid and cupric acetate.

Interference may result from organic double bonded sulfur compounds and 10 PPM or more hydrogen sulfide. The interference of the latter may be prevented by using lead acetate paper or sodium hydroxide solution.

Standards are made from an alcohol solution of known carbon disulfide content. This alcohol solution may be prepared by dissolving a weighed amount of carbon disulfide in a known volume of alcohol.

For field work, four methods of collection and analysis were presented:

PROCEDURE 1—STANDARD ABSORPTION: By means of water displacement from a reservoir, the air sample is drawn through a bubbler unit containing glass beads and reagent. After sampling, the reagent is compared with standards in tall Nessler tubes.

PROCEDURE 2—PUMP ABSORPTION: In this case the air sample is bubbled through the reagent in a test-tube by means of a hand exhaust pump. Attached to this instrument are two color standards. After calibration in known carbon disulfide atmospheres, the number of strokes necessary to produce a color equal in intensity to one of the standards is a measure of the PPM carbon disulfide.

PROCEDURE 3 — BOTTLE SAMPLE: Grab samples are taken by flushing out a citrate of magnesia pressure bottle with the contaminated air by means of a double valve one-way rubber aspirating bulb. The contents of the bottle are displaced by water through a bubbler similar to Procedure 1.

PROCEDURE 4 — GAS COLLECTING TUBE: In this grab sampling method the sample is taken by

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opening the stopcock of an evacuated tube or by flushing out as in Procedure 3. In this case, however, the reagent is added directly tc the gas collecting tube by means of capillary tubing. The tube is frequently shaken for one-half to one hour and the solution compared with standards in Nessler tubes.

Analysis of atmospheres containing, 10, 30 and 80 PPM carbon disulfide by all four procedures described, support the conclusion that all four are applicable for field work. A portion of all grab samples allowed to stand longer than 11 days before analysis demonstrates the stability of these carbon disulfide atmospheres and the reliability of the methods involved.

Since completing the original work, further investigations were carried out using a fritted glass bubbler for the absorption of the carbon disulfide from the air sample. Quantitative results were obtained at rates of flow from 1/30 to 1 liter per minute.

Higher rates of flow were not tried.

MR. G. M. REECE presented a discussion of "Comparison of Gas Recorders versus Routine Sampling for Carbon Disulfide and Hydrogen Sulfide in Air in the Viscose-Rayon Industry."

The only places in which CS_2 and H_2S samples need be taken were in the churn and spinning rooms. Typical five-months' records show the concentrations maintained.

Sampling was done by drawing the air in question through absorbing solutions and subsequently titrating. Both were done by familiar iodimetric reactions. A device which samples continuously and from which the results are then obtained by subsequent laboratory analyses was also described, as were some grab-sampling methods which were specially adapted to the getting of quick results in the plant.

Three instruments have been used for the determining and recording of low concentrations of CS_2 and H_2S.

1. The Thomas recorder, in which the CS_2 and H_2S are burned to SO_2, absorbed in an acidulated H_2O_2 reagent, and recorded by the electrical conductivity method. The instrument is sturdy, sensitive, and reliable. The result is the average of a sample over a definite time interval, such as 10 or 30 minutes.

2. The fog method requires the CS_2 and H_2S to be burned to SO_2 and then oxidized to SO_3. By passing the SO_3 over a hot-water bath, the density of the resulting fog can be measured photo-electrically. This method is instantaneous and is well adapted to follow rapidly changes in concentrations.

3. The apparatus for the determination of H_2S is based on the principle of determining photo-electrically the intensity of color formed by H_2S on lead-acetate paper. It is sensitive to within plus or minus 0.5 PPM up to 10 PPM, requires little attention, is reliable, and gives readings integrated over short intervals, such as two minutes.

MR. E. C. BARNES presented a paper on "The Dropping Mercury Electrode for Lead Analysis."

It has recently been demonstrated that the dropping mercury electrode is practical for rapid quantitative analysis of nearly all metallic ions and substances of importance in industrial hygiene problems. These analyses are most successful in concentrations between 10^{-5} and 10^{-2} molar and in quantities of 1 cc. to 200 cc., or even a drop can be used with special apparatus.

The analytical apparatus consists essentially of a cell with a mercury pool in the bottom as one electrode and a fine capillary suspended in the solution from the top to act as the other electrode. Periodically, drops of mercury fall into the solution and as each drop grows, a diffusion of ions passes from the solution into the mercury drop. From the applied voltage to the cell and the corresponding galvanometer deflection, a characteristic current voltage curve is obtained. The shape of this curve depends upon the kind of ion and its concentration in the solution.

The three present commercial instruments are each characterized by their method of recording the current-voltage curve.

Lead was quantitatively determined in solutions containing only lead and in solutions containing a number of other ions in addition to lead, such as zinc, cadmium, stannic tin, etc. Lead fume samples from pure lead and from solder were put into solution and also measured quantitatively. In all cases the lead concentrations were favorably checked by the dithizone method.

MR. H. A. CRANSTON discussed "Dropping Mercury Electrode for Lead Analysis (Application to Lead in Urine)."

The dropping mercury electrode of Heyrovsky may be defined as the electro-deposition of a metallic or other ion upon a cathode, the surface of which cathode is constantly renewed. This electro-deposition, or plating from a solution, follows the Nerst formula.

The dropping mercury electrode differs from the ordinary electro-analysis in that, instead of weighing the metal deposited, the current flow at all points during the deposition is measured; and from this curve, the concentration of the metallic, or other ion under investigation, is determined.

As applied to the determination of lead in urine, this procedure is of extreme simplicity. The various steps are:

(a) Addition of sodium di-phosphate to the urine sample.

(b) Alkalization with ammonium hydroxide.

(c) Centrifuging and washing the precipitate with 1% ammonium hydroxide.

(d) Solution of the washed precipitate in HCl and tartaric acid.

(e) Gassing with hydrogen.

(f) Polarization.

The method of lead urinalysis outlined has the advantage of brevity of time consumed, lack of interference by other metals, and permanency of

the record. There is no personal equation in the test and it may be carried out routinely in large numbers of samples in a short time. Recovery experiments show that 99% plus of the lead contained in the urine is recorded by the technique, and checks by spectrographic and chemical analyses fail to disclose discrepancies of specificity.

DR. WILLIAM G. FREDRICK spoke on "The Estimation of Small Amounts of Antimony with Rhodamine B."

Rhodamine B reacts with Sb^{v} in HCl solution or H_2SO_4 solution containing chloride ion to form a red, water-insoluble stable compound, soluble in organic solvents. The excess reagent is destroyed with bromine, the rhodamine B complex put into solution by addition of alcohol and the amount present estimated colorimetrically. Practically all acid radicals except chloride and sulfate interfere as do As, Fe and certain metals of the dithizone group. The latter interference can be avoided by preliminary extraction with dithizone. The method will detect as little as 0.1 gamma Sb^{v} in 5 ml. of solution. The exact procedure was described for the concentration range 0.1-300 gamma of Sb. The method is rapid, inexpensive and specific.

MR. V. F. HANSON described "A Rapid Photometric Method for Determining Micro-quantities of Solvent Vapors in Air."

The increase in the use of solvents has necessitated the development of a rapid, reliable, sensitive analytical measurement for the concentrations of such vapors in the air.

A number of methods were first investigated, such as thermal decomposition; alcoholic absorption and colorimetric method; specific gravity measurements; refractive index measurement; weight gained by charcoal absorption; thermal conductivity; vapor pressure of condensed solvent; and flame tests. The critical examination of these methods indicated that they did not meet the requirements of rapidity, reliability, accuracy, and simplicity.

The principle of the new analytical apparatus, which was demonstrated during the discussion of this subject, is that all vapors absorb light; in other words, are partially opaque in certain regions of the spectrum. In the demonstration, a fluorescent screen which represented the light source and two beakers on hot plates were so arranged that the clouds of vapor from perchlorethylene in one and carbon tetrachloride in the other cast a shadow on the screen. When visible light was used it was noted that there were no shadows cast on the screen by the vapors from the solvents in the beakers. However, when the screen was illuminated by invisible ultraviolet light, which was converted into visible light when it struck the fluorescent surface of the screen, it was noted that dense dark shadows were cast on the screen by the perchlorethylene vapors, but none by the carbon tetrachloride vapors.

Upon this principle, therefore, an apparatus was built which was called the R. & H. Tri-Per-Analyzer.

This new apparatus was exhibited and demonstrated and also a schematic arrangement of it was projected upon the screen by means of a lantern slide. Lantern slides of calibration curves for various substances were also shown on the screen.

Tables of maximum sensitivity of the R. & H. apparatus for various vapors tested to date were also submitted and further, a list of substances to which the R. & H. Analyzer does not respond.

In conclusion, it can be stated that the analyzer has proved to be an extremely valuable tool in the following procedures:

1. Checking solvent vapor concentrations near equipment using solvents.
2. Testing the performance of ventilating systems.
3. Checking the efficiency of solvent absorbents and adsorbents.
4. Checking vent losses in process equipment.
5. Measuring specific vapor concentrations in mixtures.

It was further stated that it is possible to make two determinations per minute of vapors in concentrations as low as 0.2-10 PPM with high accuracy. The apparatus for making these analyses is portable and may be operated by an ordinary technician.

MR. THEODORE HATCH spoke on "Economy in Exhaust System Design."

The items of cost were discussed, including original cost of installation, power and maintenance.

One must always keep in mind that in these problems we are moving contaminated air; exhaust hood design is, therefore, important.

A lantern slide was shown of a so-called "dustless ore chute," which can be used by the principle of including a surge bin in the installation.

Various principles were discussed, including the suction action of wheels, convection currents by means of steam, leaks in pneumatic tools which disperse dust, tunnel baffles, hood baffles, and various resistance factors.

It was especially emphasized that a balance of flow may decrease running expense by as much as 30%. An example was given of a dust conveyor system in which the amount of horsepower used was lowered from 22 to 3.

It is very necessary that we have a restatement of the problem of carrying velocities.

Long radius elbows may be used to reduce resistance. Streamlined junctions are important and filter sizes are also factors.

It was, therefore, concluded that the various factors as discussed can, when taken together, reduce power use about 25% all told.

On account of the illness of DR. H. B. MELLER, Managing Director of the Air Hygiene Foundation of America, Inc., it was not possible to have the advantage of his great experience in opening discussion of the papers.

Tuesday Evening

THE annual dinner of the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION was a symposium on "Industrial Hygiene and National Defense," at which MR. W. P. YANT, of Pittsburgh, the President of the Association, presided.

PROF. PHILIP DRINKER stated that the association was a young group. There are three possibilities of the outcome of the present war: (1) the allies may win, after which we shall have friendly relationships; (2) the Germans may win, which imposes upon us the policy of isolation; and (3) there may be a stalemate, which will be productive of difficult times for all.

Industrial hygiene workers have won the recognition of employers and are gradually winning that of labor. Many of our people belong to reserve units and services.

As a body we would like the government to tell us what we can do and we would suggest a message be sent to Federal authorities offering our services.

DR. CAREY P. McCORD believed that the responsibility now rests on industry and industrial physicians for the conservation of manpower in the "stepping-up" of production. Congestion, epidemics, acceptance of older persons and the handicapped, the use of new processes and materials, constitute problems which must be solved.

As a group, industrial physicians are trained and have had much experience in industry, in coping with health problems, and we are, therefore, ready to serve as needed.

MR. CHANNING R. DOOLEY stated that the essential principle is to do the best we can with what we have—the best fitting of the worker to the job possible. This includes adapting the handicapped.

Experiences were cited in which the men available were catalogued in reference to training, according to what they said they could do; it was discovered that only one out of three were really proficient as they claimed and that further training was necessary.

Management must be distinctly behind the physician and the engineer, but must also realize that we still do not know how to manage people—this does not obviate the necessity for teamwork, but makes it all the more vital.

GENERAL AMOS A. FRIES took as the theme of his talk the Biblical quotation, "He that hath no sword, let him sell his garment and buy one." The greatest sin against the national defense is the discouragement of the engendering of patriotism in the young and destroying the confidence of youth.

A series of reminiscences concerning his experiences in the World War were given and particular emphasis was placed on experiences relative to changes in gas masks.

The job of industrial medicine is a direct asset in the national defense, particularly in the preservation of expert workers, which is vital even in peace time.

We must continue to teach men to laugh, for those who could laugh and who could sleep came back from the last war unbroken. We should remember also that there is a place for every man.

Defense is distinctly worth what it costs, but we must cut through trade barriers.

Everything done in peace is applicable to war, only it is intensified.

MR. L. S. AYARS gave an excellent demonstration of the fundamentals of sound and acoustics, by the aid of sound motion picture films. The material contained methods of measurement of sound, as well as methods of sound control, and examples were scattered throughout the sound film with actual occurrences.

As an example of industrial efficiency being increased in a group of office workers a prominent insurance company showed an increase in efficiency of 8.8% after quieting influences were installed.

There was a demonstration of the noise meter with the cooperation of the audience, the dial of the noise meter being reflected on the screen, so that the changes in the readings could be appreciated by those present.

It was generally concluded that a reduction of 10 to 12 decibels in sound intensity was a practical matter and one which would materially increase comfort in the working environment.

Wednesday Morning, June 5

MR. WARREN A. COOK, President-Elect and Chairman of this session, varied the program somewhat from the original schedule.

DR. S. W. MARCHMONT-ROBINSON discussed "Esimation of Lead Exposure by a Study of Urinary Excretion and the Effect of Vitamin C on the Worker."

Investigation of the lead hazard in automobile body construction, in which lead solder is applied over welded seams and then ground flush, showed that:

(a) The grinding with portable machines throws very large quantities of lead dust into the surrounding air.

(b) The area of visual contamination is very much greater than the area in which there are particles of inhalable size.

(c) The mean particle size is 50 microns and reaches 300 microns due to the softness of the ground material.

(d) The amount of inhalable lead dust is 18% of the total lead in the air, and the total quantity varies widely.

Lead urinalysis on all the workers within the contaminated area showed that approximately 20% of them were absorbing lead in greater quantities than normal. Urinalysis for lead seems to give a more accurate estimate of the exposure than does air sampling and dust counts alone.

Workers were given 50 mgms. of ascorbic acid daily, and over an 11-month period have shown increased efficiency and a distinct gain in general health and lessened fatigue.

The hazard of lead grinding in automobile body construction should not be regarded as negligible; but does not warrant the extreme alarm that has been manifested by both management and labor. The use of ascorbic acid or vitamin C should not be regarded as a panacea; but does offer a distinct advantage as a prophylactic against the storage of the absorbed lead, and certainly aids in protecting the workers against the usual fatigue and low grade symptoms encountered in work of this kind.

The majority of workers (80%) in the Chicago assembly plant of the Ford Motor Company, where this investigation was conducted, have been employed at least five years and have been under the observation of the essayist for the whole of this period.

MR. EDWIN D. MARTIN presented the subject "Control of Possible Lead Hazards in the Production and Use of Leaded Steels."

The rapid adoption of leaded steels because of better machining characteristics, has made it necessary to give consideration to the industrial hygiene problems involved. The amount of lead used in the steel is about ¼ of 1% and this does not go into solution or form a compound with the iron, but is retained in particulate form, as shown by illustrations taken from microscopic examinations.

Air tests were made using four impingers in series attached also to an electric precipitator. A modified dithizone method was used in the analysis of the air samples. One hundred and twenty-four samples averaged 7.3 milligrams of lead per ten cubic meters of air. Hourly tests were made.

Beam and stack samples were also analyzed for contained lead.

Experiments were also conducted relative to the occurrence of the measurement of the lead content of air, relating to the amount released when processing leaded steel, such as in welding and other operations. It was concluded that in this series there were no amounts of lead which could be considered injurious.

MR. H. W. RUF presented the subject "Studies of the Lead Hazard in Printing—Engineering and Chemical Phases."

In this study, the Mine Safety Appliances Company's electric precipitator was used as the sampling apparatus and the samples were analyzed by the well-known dithizone method.

Samples taken at the nose of linotype operators varied from 0.17 to 0.49 milligrams per 10 cubic meters of air; over the pots the concentration was less than 0.1 to 0.54 milligrams; and in the monotype operations the concentration was less than 0.1 to 0.6 milligram.

Carbon monoxide determinations of stack gases ran over 1500 parts per million, but when gas-fired machines were put out of use, approximated only 400 parts per million, which is the standard for stack gas content. It is recommended, therefore, that the stacks of the gas-fired linotypes be vented.

The amount of lead found in remelting operations, agitating and drossing, showed the highest lead content and should be vented. Other operations showed lead ranges far from being significant amounts.

DR. E. L. BELKNAP continued in the discussion of "Studies of the Lead Hazard in Printing—Medical Phases."

Only drossing and cleaning pots and plungers have been found to present significant exposures.

A series of 40 men were examined both during summer and winter, 62% of whom were 30 years and over in age, and 70% of whom had worked five years or more. Gastro-intestinal and nervous manifestations were particularly searched for in this survey.

All of these individuals were normal or overweight; the blood pressure was within a fairly normal range; there was no lead line, although 40% of the men had pyorrhea; there was a general average of 85% of hemoglobin; the urines of 30 individuals which were available in 24-hour specimens, showed 0.11 to 0.36 milligrams of lead per liter; there was no correlation between the exposure and the urine content; there was no history of intoxication and no evidence of it.

It was, therefore, concluded that there was no health hazard in this work, except in cleaning or remelt work.

DR. S. F. MEEK spoke on "Correlation Coefficient Between Basophilic Aggregation Test and Lead in the Urine."

This was a study in which 202 men were involved on whom tests were made.

The technique used was a modification of the dithizone test and also checks were made by photometer. The mean finding in this series was 0.05 milligrams per liter in 31 men.

The correlation coefficient on one group was 0.59 and on another group was 0.69 which were considered significant values.

The experience in this study led the investigators to believe that any three instantaneous urine samples are representative of lead content and that a 24-hour sample is therefore not necessary.

It was also established that no correlation occurs in chronic cases when examinations are made long after cessation of exposure.

DR. ROBERT A. KEHOE gave the results of "Experimental Studies on the Ingestion of Lead."

The mean values for the daily intake of lead in the food and drink of three normal American adults, as determined by recent and precise analytical methods, were 0.24, 0.29 and 0.35 mg., as compared with values of 0.25, 0.34, and 0.38 mg. respectively for their daily fecal lead output of lead during the same period.

The total quantities of lead ingested with their freely chosen food and beverages, by two American adults during periods of 16 weeks and eight weeks, respectively, were 25.76 mg. and 19.51 mg.; the corresponding quantities of the combined output of lead in the feces and urine of the two were 31.14 mg. and 20.58 mg. respectively.

A highly significant degree of correlation existed between the lead content of the food for each daily period and that of the feces for the day following.

In observations which extended over a period of a year, 12 normal American adults, engaged in occupations involving a moderate degree of physical effort, consumed a mean daily weight of 2135 grams of food and beverages per person (excluding occasional large volumes of beer and wine), the mean lead content of which was 0.32 mg., equivalent to 0.15 parts per million.

Experimental studies were carried out on two healthy adults to whom 1 mg. and 2 mg. of lead, respectively, as a solution of lead acetate were administered daily in three doses taken with the meals, for periods of 39 lunar months, in the former case, and 13 lunar months in the latter. Clinical data were collected in daily and weekly intervals, while the daily oral intake and the daily alimentary and urinary output of lead were determined over the entire period of the study. The results may be summarized as follows: (1) no definite or suggestive evidence of lead intoxication developed in either subject; (2) no microscopic evidence of any hematopoetic response to lead absorption was found in daily examinations of the blood; (3) the fecal output of lead in each case increased abruptly with the initiation of the experiment, promptly reached a maximal level, and accounted for the evacuation of about 90% of the ingested lead from the body; (4) the urinary lead concentration and output increased gradually in each case, (more rapidly and to a higher level in the subject on the higher dosage), reached a substantially constant level in somewhat less than a year in the subject on the lower dosage, and in about 10 weeks in the other subject, and resulted in both cases in the elimination of about 5% of the ingested lead; (5) the lead concentration in the blood of the two subjects increased in general correspondence with the increase in the urinary concentration, but to a somewhat lesser degree; (6) in the case of the subject to whom 1 mg. of lead was administered daily, the mean level of lead concentration in the urine in the last four months of the observations was 0.068 mg. per liter, and the average concentration in the blood for this period was 0.059 mg. per 100 grams; (7) the subject on 2 mg. daily had corresponding values of 0.087 mg. per liter of urine and 0.063 mg. per 100 grams of blood during the same period; (8) the lead concentration in the blood of the subjects was subject to insignificant variation during the course of a day, and to only minor variations from day to day, while the urinary lead concentration, as well as output per unit of time, varied widely in accordance with the volume of water excreted by the kidneys; (9) the total amount of lead retained in the tissues of both subjects over the period of study was quite small, and with due regard for an additional and undetermined loss by way of the perspiration, as well as the effects of certain factors which could not be controlled entirely, it was almost negligible; (10) the discrepancy between the total oral lead intake and the output in the feces and urine of the subject on 1 mg. daily of administered lead for a period of 39 lunar months was 78.23 mg. of lead, while the corresponding discrepancy in the case of subject on the 2 mg. dosage for 13 lunar months was 51.43 mg., each of these quantities representing about 5% of the lead ingested during the respective periods; (11) the combined evidence indicates that some actual retention of lead occurred in both subjects, and that the rate of retention was substantially constant for each subject over the period of the observations, being greater in the subject to whom the larger dose of lead was administered.

The following conclusions are justified by these results:

1. The largest proportion of the lead which is ingested by normal persons, with food or otherwise, whether in soluble or insoluble form, is eliminated in the feces without absorption.

2. The daily ingestion of lead in quantities somewhat in excess of 1 mg. by healthy adults, over long periods of time (3½ years) is not only compatible with the maintenance of normal health and well-being, but is also associated with such an increase in the elimination of lead as to result only in a slight and almost negligible retention of lead in the body.

3. The daily ingestion of slightly more than 2 mg. of lead, for a period of more than one year, failed to result in any demonstrable effect upon the health or well-being of a healthy adult, but induced a level of lead elimination higher than that caused by the ingestion of 1 mg. daily, and a slightly greater rate of lead retention in the tissues.

4. Maintained concentrations of 0.06 to 0.07 mg. of lead per 100 grams of blood over periods of months are entirely compatible with the normal health and well-being of human adults.

5. Concentrations of lead in the urine which vary from 0.05 to 0.15 mg. per liter and slightly more, with mean concentrations as high as 0.09 mg. per liter over long periods of time, correspond with lead concentrations in the blood of 0.06 to 0.07 mg. per 100 grams, and likewise are compatible with the normal health and well-being of human adults.

6. The quantities of lead ingested in food and beverages, by adult citizens in various parts of the United States of America, vary from somewhat less than 0.10 mg. to somewhat more than 2.00 mg. with a mean value of approximately 0.32 mg. per day.

7. From the results of the foregoing studies, it would appear that there is a sufficient factor of safety in relation to the lead content of the general food materials in the United States.

Wednesday Afternoon

MR. A. W. HUNTER and PROF. PHILIP DRINKER presented the subject "The Determination and Significance of Carbon Disulfide in Urine and Blood."

The method of determination described is rapid and easy of manipulation. It is based on the reaction of CS_2 with diethylamine and copper acetate to form the yellow cupric diethyldithiocarbamate which is soluble in alcohol to give a yellow solution. The intensity of the color is a direct measure of the amount of CS_2 present. The CS_2 is extracted from the urine and blood with petroleum ether and the extract diluted with alcohol and reacted with diethylamine and copper acetate, to give a yellow solution. The intensity of the color formed is measured, preferably with a photoelectric colorimeter and compared with readings obtained with solutions containing known amounts of CS_2.

The method has an accuracy of 90% for blood and 95% for urine.

PROF. DRINKER stated that the development by MR. HUNTER, of the American Viscose Corporation, of a method for determining very small amounts of CS_2 in urine and in blood makes practicable metabolic studies of CS_2 in men and animals.

In connection with the development of recorders for CS_2, we made a constant feed device, which will deliver any desired CS_2 concentration to a suitable reservoir. From this reservoir, men in our laboratory have been breathing CS_2 concentrations varying from 5 PPM to 30 PPM for periods varying from a few minutes to an hour. At these levels, which are well within those found to be safe in industry, the time limit per experiment is due simply to the inconvenience and annoyance to the subject. The air-vapor mixture, however, is not in the least objectionable and after the first breath, even at 35 PPM, the subject does not detect any CS_2 odor.

Samples of urine taken within a few minutes after inhalation show CS_2 and continue to do so for 36 - 48 hours for inspired air concentrations around the 35 PPM level. At lower concentrations, CS_2 is detectable one or two hours after experimental inhalation has ceased and persists for 24 - 36 hours. We have no data on ourselves for eight-hour exposures, but one or two determinations by MR. HUNTER on men who have had a day's exposure to low concentrations indicate that CS_2 persists in urine for many hours.

Tebbens, in our laboratory, found that the distribution coefficient for CS_2, between air and water, was 0.65, but that the coefficient between air and blood was considerably higher. Haggard found a coefficient of 15 for ethyl ether, between air and water. In this case, there was no appreciable difference between ether solubilities in water and blood. Working with benzene, Schrenk finds that blood absorbs about twice as much as does plasma. It is not surprising, therefore, that blood takes up CS_2, an excellent solvent, more than does water.

Unfortunately, for our problem, we are concerned industrially with concentration levels far below those used by Haggard or by Schrenk. Haggard dealt in levels measured in per cent, while Schrenk used values from 500 to 1,500 PPM. Industrially, we are concerned with CS_2 concentrations in the range of about 2 to 30 PPM. This makes the problem somewhat more difficult, but HUNTER's work makes possible the necessary determinations at concentrations which we did not think possible previously.

We shall continue the inhalation experiments and are also planning a series on animals, by which we expect to determine the rate of saturation and desaturation of blood when the animal has breathed CS_2 in the concentration levels of industrial interest.

MR. WILLIAM R. BRADLEY gave the results of "Animal Studies on the Toxicity of Antimony."

The wide use of antimony and its compounds and their uses in the manufacture of munitions have shown the importance of knowing how these substances act physiologically.

Animal experiments were made on over 200 animals, which were fed varying amounts, and after which examinations of the tissues were made by chemical determinations. Intraperitoneal injections were given after the determination of the minimum lethal dose of the different compounds on rats.

Blood studies showed a consistent eosinophilia. Death was attributed to degenerative myocardial changes and also to degenerative liver changes.

Solution of antimony tartrate gave acute splenic congestion. Acute glomerular nephritis was also observed and myocardial degeneration with pigment occurred. Liver changes showed an increase in the number of liver cells and a periportal fibrosis.

Lead experiments were also done with different compounds after the minimum lethal dose was established for different varieties of substances. Here there was a basophilic aggregation averaging 2% and in a massive dose series basophilic aggregation was observed varying from 5 to 24%.

In conclusion, it was shown that antimony damages particularly liver and kidney tissues, as well as bone. Spectrographic determinations agreed with chemical determinations made in this series.

DR. H. H. SCHRENK discussed the subject "Absorption, Distribution and Elimination of Benzene from Body Tissues and Fluids of Dogs Exposed to Benzene Vapor in Air."

This series of experiments was directed toward ascertaining the physiological phenomena which occur after exposure to benzol vapor in air.

It was determined among other things that the saturation of the blood (2 mgs. per 100 cc. of blood) occurs within a few hours, varying from 30 minutes to two hours. Elimination on the other hand, occurs after two hours' exposure within a period of two hours; elimination after a four-hour exposure occurs in a period of over two hours, and

finally, elimination after an exposure of 37½ hours occupies from 10 to 24 hours.

It is most important to point out that there is a direct linear relationship between the parts per million of benzol in air and the blood content.

Changes take place mainly in the bone marrow, and secondarily in the blood, urine and fatty tissue, the latter showing greater changes than the blood and urine.

Benzol may be excreted through the gastric mucous membrane fat because it saturates slowly, eliminates benzol slowly.

It is impossible to give the actual details of this paper and reference should be made to the original paper for detailed data.

MR. E. M. ADAMS presented the subject "The Response of Rabbit Skin to Compounds Reported to Have Caused Acneform Dermatitis."

The object of these experiments was to repeat in animals the analogous changes which had already been observed in men.

Most substances which caused a dermatitis of this type show a rapid response and decline, the changes being mainly inflammatory in type. One type of change has shown a latent response after proliferation of epithelium.

Five classes were observed—(1) least detectable; (2) slight change; (3) moderate change; (4) moderately severe; and (5) severe.

Significant changes included thickening of the skin, exfoliation, hyperplasia of hair follicles, hyperplasia of epithelium, and keratinization of epithelium.

Reactions were observed after exposure to chlorinated diphenyls, chlorinated naphthalenes, oxidation products of chlorinated diphenyls, and petroleum oils.

There were five instances where mitotic figures were seen in cross-sections of the skin examined. Sebaceous cysts in this series of experiments were apparently the result of epithelial hyperplasia.

It was, therefore, concluded from these animal experiments that an experimental method has thus been established for trying out other substances which may have irritant qualities for the skin.

DR. WILLARD MACHLE discussed "The Toxicity of Nitroparaffins and Their Derivatives."

Commercial production of nitroparaffins and derivatives prompted the investigation of their toxicity and behavior in the body. Results of study covered toxicity, by oral administration and skin application, of nitromethane, nitroethane, 1-nitropropane, 2-nitropropane, 1-nitrobutane, two chloronitroparaffins, three nitroalcohols and the oleic and stearic acid soaps of the aminoalcohols.

The report included response to exposure, by inhalation, to nitromethane, nitroethane and 1-nitropropane.

Exposures were determined by the interferometer and chemical color reactions. It was found that when the concentration x the time was over 1, death occurred. Blood changes were not specific, but the gross pathology included a fatty infiltration of the liver.

Clinical observations in a group of exposed employees, who were examined after exposures, included no positive results except a variability in pulse pressure.

PROF. C. P. YAGLOU discussed "The Significance of Clothing in Air-Conditioning Standards."

In a series of male and female subjects, it was discovered that skin temperatures were higher in men than in women and clothes temperatures showed just the opposite results. In most subjects, the feet and hands were 5° cooler than the rest of the body.

The above conditions which differ in men and women were found to be true only when they dressed characteristically; if, however, they both dressed alike, then the skin temperatures were the same.

It was also discovered that the minimum temperature for comfort was about 53°.

The conclusion reached from these experiments was that we ought to be able to get along with an inside temperature of 68 to 70 during the winter and a temperature of 85 in the summer by adjusting the amount and the weight of clothing.

DR. D. B. DILL completed the program of the Industrial Hygiene Sessions, presenting the subject "The Effects of Humid Heat on Colored and on White Workmen."

There are a number of ideas which supplied the background for this study. The question of temperatures and available energy association arose. The association of efficiency in war and sports has also been an important conception. Then, too, we must realize that air-conditioning will always be unavailable to a considerable number of industrial workers.

We must realize that although negroes comprise only 10% of the population, they are represented by relatively large numbers in sports and have come to be very proficient in these activities. An investigation last summer was made on white and colored sharecroppers, arrangements being made to have them work on treadmills and be observed physiologically during these experiments.

It was found that the negroes were able to run longer but were not superior in exhausting types of work. In experiments on the two-hour treadmill walk, the colored group showed the highest efficiency as compared with the white. Negroes drank more water, but lost less weight and did less sweating. The body temperature was lower in the colored group after the experimental walk. The heart rate was lower in the negro and more stable.

There was also evidence that the negro loses less salt during sweating.

These observations lead us to believe that the negro is more efficient in warmer atmospheres, on account of the difference in physiology between the negroes and the whites, as observed.

American Association of Industrial Physicians and Surgeons

Thursday Morning, June 6

DR. McIVER WOODY, President of the Association, opened the scientific session by giving his Presidential Address.

Comment was made on the present war situation and the necessity for the revisions of medical procedures. The only certainty is change, but the human body does not change—it is subject to the same factors. Medicine knows no international boundaries. But there will be a new order of things and new opportunities. Industrial physicians will undergo their greatest tests in the near future, a real test of medical ability in relationship to the national defense. Dr. Woody closed by quoting from Lincoln's Gettysburg Address.

MR. HARRY A. NELSON spoke on "Pre-employment Physical Examinations."

The evolution of compensation acts with respect to the coverage of injuries was reviewed and reference was made especially to the provisions in the Wisconsin law. There is a rather broad provision which provides for safety and health among employees and that the commission itself should do everything possible to safeguard the health of employees. This has come to be interpreted as the inclusion of the man himself, because man-failure is the most important factor in the production of accidents.

The emphasis today is on prevention. It is impossible to control occupational diseases without examinations, although there is a divergence of opinion relative to pre-employment examinations in industry. However, even labor agrees to the doing of pre-employment examinations if the material is not used indiscriminately. Some employers and insurance companies have been at fault here in the past.

In Wisconsin an employer loses his insurance rating and his insurance license for oppressive practices relative to examinations and employment. But it is believed that education rather than compulsion is the basis for progress in this problem.

An outline of the optional Wisconsin Plan of Pre-employment Examinations for Industry was given. From the results so far, it seems that such examinations may some day be universal and be standardized to some degree.

Especial comments were made relative to tuberculosis, syphilis and dermatitis.

The method of reporting was especially emphasized, with provision for the reporting of defects and with provisions for the sending of copy of the examination records to the family physician in each instance. It has been found feasible to send copy of certain of the findings only to the employer in each instance.

The various committees at work on this project have found that it was not practicable in any sense to restrict the use of findings of such examinations in compensation hearings.

As to the selection of employees, such decision is left entirely to the discretion of the examining physician.

Employers need to be educated to the idea that pre-employment examinations are a good investment. Although the system is not perfect, it is believed that it is a move in the right direction.

DR. J. J. WITTMER, in discussing MR. NELSON'S paper, commented that it was a masterful presentation. He was particularly impressed by labor's attitude and by the excellent program of industrial examinations planned by the State of Wisconsin.

The attitude of the industrial physician is the most important factor in convincing the employee of the real worth and the sincerity and purpose of the examinations. It is obvious that we must have better records.

The term "preplacement examinations" was suggested.

A great deal better spirit would be promoted if the examiner kept in mind that the man is looking for work—in these relationships, it is important to "fit the picture to another frame" when there are difficulties of adjusting the man to the job.

DR. VICTOR G. HEISER stated that in most instances the medical profession looked only at the details of the examinations and did not consider the social implications. Reference was made to a meeting in Washington, D.C., recently in which labor voiced the contention that examinations were used to prevent employment and that labor wishes to be assured that the unemployables will be properly treated and that they will not be entirely neglected. At present, the average rejection is approximately 5%. The complaint has always been registered that the medical profession has no definite standards of acceptance and rejection. It would seem wise that somebody undertake to prepare such standards.

MR. NELSON, in closing, believed that if the important objective of finding a job for the man was always kept in mind by the examiner, physical examinations would be in better repute.

DR. JOHN J. MOORHEAD presented the subject "Care and Handling of Traumatic Injuries."

The essayist presented a picture of the 1940 model of traumatic surgery and stated that it was the most mechanized form of surgery.

At the outset the cardinal principles are safety, simplicity and establishibility.

Traumatic surgery is reparative—general surgery is ablative. There is no incubation period in trauma. Contusion and laceration are the rule. Efficiency in results depends upon early attack—within the first six hours.

In the treatment of wounds, antiseptics provide no substitute for soap and water; the best procedures allow primary sutures.

Rest (splinting) is an important item. Treated

wounds should be let alone for three or four days, unless there are indications to the contrary.

Infected wounds present a different picture, there is no hurry here and one must wait for fluctuation and localization.

Hand infection has been much mismanaged.

Burns should be considered as infected wounds, yielding better to systemic treatment plus local treatment.

The essayist has great respect for the knee joint with regard to injuries.

Fracture methods are probably becoming more standardized than other traumatology—such injuries should be considered a wound of the bone structure. For these we have the following phases of treatment: (1) manual direction; (2) adhesive traction; (3) skeletal traction; and (4) open operation only when necessary.

In all traumatology, real conservation is the most important principle.

Two of our recent problems have been injuries to the os calcis and the over-rating of disc pathology.

MR. MOORHEAD closed a very excellent paper by reading his Ten Commandments of Traumatic Surgery, for the details of which reference should be made to the original paper.

DR. H. V. SPAULDING, in discussing DR. MOORHEAD'S presentation, stated that it was a priceless discussion. He was particularly impressed by the fundamentals, safety, simplicity and establishability.

In New York City, there has been an amazing experience in reconstruction hospital work. Traumatic surgery is really the war surgery of peace time.

It is important to keep in mind that compensation cases in surgery are affected by many other social factors, even after the surgery has been completed. The end results are public records. There is a distinct obligation to return the man to industry as promptly as possible and hence render a real service to industry.

DR. E. C. HOLMBLAD, in further discussing DR. MOORHEAD'S paper, was much impressed by the 1940 model of traumatic surgery. The traumatic surgeon should be just as ready and willing to get out of bed at one o'clock in the morning to treat a broken leg as he would be to do a private emergency case. The early hospitalization of infection cases is a primary consideration. DR. HOLMBLAD was much impressed by the Ten Commandments and would give them study.

DR. J. HUBER WAGNER discussed the subject "Back Injuries."

A simple classification of low back sprain was given and reference made to the lumbosacral and iliosacral regions.

It is assumed that all have an adequate knowledge of the anatomy of this portion of the body.

The type of pain is important, the location and position, what events follow the injury, habits prior to the injury, and also the work history and the history of the accident itself.

A thorough examination of the stripped individual is essential.

In many instances we have an impression rather than make a diagnosis. Ligaments, bones, muscles, nerves may all be involved.

It is necessary to give consideration both to primary and secondary trauma.

In muscle types, the parts should be kept mobile and the use of infra-red rays and massage is of benefit.

Sandbag bracing and morphine can be used for acute pain. Fixation does more harm than good on account of atrophy through disuse.

In subluxations, x-ray films should be used, although in 95% of cases they are negative.

In acute cases, the injection treatment is of use regardless of the type of injury. In such instances, 12% are ambulatory, 25% are relieved, and the other 63% are negative, in a series of 60 patients so treated.

Injection of opaque material into the spinal canal should only be used as a last resort procedure and should be followed by removal of the opaque material.

In chronic unyielding cases (general fibrosis types), manipulation under anesthesia done carefully is usually of help. Artificial fever therapy may also be efficacious. Fusion should only be used as a last resort after repeated failures of other methods.

The economic factor is very important; it so happens that workers are frequently advised relative to compensation problems by various kinds of persons, and this should not be overlooked.

The full cooperation of the employer is a necessary factor and there must be coordination between him and the insurance company.

It was believed that there is less malingering than a lack of the will to get well.

DR. WILLIS W. LASHER, in discussing DR. WAGNER'S paper, was in entire agreement, and complimented the essayist on his frankness.

In the experience of DR. LASHER, if a man begins with a chip on his shoulder, then proceeds to get clubby, and then he gets confidential and finally says that he wants no compensation—nine out of 10 such cases are what may be called bad cases.

Of the two, the slowly developing case is worse as to outcome and results than the rapidly or suddenly developing case.

In a series of 200 cases, three or four had definite pitting edema in the lumbar region.

In experience with injections at hospitals, they have so far been regarded as palliative in the estimation of the discussant.

Certainly casts cause a great deal of trouble, and belts and baking were denounced.

Light work and careful early settlement do much to straighten out the picture—if we fail here, the patient will probably have a "fat, flabby and fixed idea." Operation, of course, is the last resort.

Round Table Luncheon

THE round table luncheon on "Who Can Work: Evaluation of Physical Fitness for the Job," was conducted by DR. MICHAEL LAKE.

Dr. Lake stated that the purpose of examinations is to (1) rule out contagious diseases; (2) keep down compensation costs; and (3) keep down absenteeism. The question was proposed as to whether we are justified in keeping out those who have chronic illnesses.

Dr. C. O. Sappington opened the discussion by pointing out the great economic losses to industry because of inability to work caused in approximately 94% of instances by non-industrial illness —that the 25% of time that a man spends in employment is responsible only for 6% of his annual disablement. This is a rather important point when considering what persons can work inside of industry and gives the economic basis for proper control of causative factors.

Dr. W. A. Sawyer believed that what could be done depended on the setup, whether the organization had a benefit association, and other similar factors. Everything must be done to make an effective producing unit.

Dr. C. F. N. Schram thought that correction of defects to obtain a job was a very important principle. Industry is doing a good job to help such men.

Dr. Edward Holmblad believed that conditional employment offers a solution to the problem in many instances. A case of a prospective employee with bad teeth was cited, which was finally cleared up after the man was accepted conditionally and put on a five-month probationary period. Corrective surgery helps a great deal. The epileptic should be sent to the proper clinic. It should be emphasized that the principle is to help the prospective employee get well. An instance was mentioned of where a large organization routinely employs men with hernia and after many years has not had an unfavorable experience.

Dr. B. L. Vosburgh discussed the consideration of coronary disease and hypertension without disease. In certain instances of this type, work has an actual salutary effect on constitutional ailments, not only in these types of cases, but in others. Emphasis should be placed on the point of view of the examinee.

Dr. Victor G. Heiser believed that an educational campaign should be carried on with labor to show the workers what advantages are to be obtained from various types of examinations. Such campaigns can best be conducted by medical men.

Dr. W. A. Sawyer believed that examinations should be done with a spirit of helpfulness, to be most effective.

Dr. G. F. Sykes believed that reference to certain hospital schemes would be of value in accepting certain sub-standard conditions in prospective employees, for example, hernia.

Dr. Frederick Slobe thought that conditions were entirely different in small industries as compared with large well developed groups. There are variations also in different states as to statutory requirements. The public relations aspect of this problem is the most important phase of the whole matter.

In closing the luncheon round table, Dr. Lake stated that in problems of evaluation of physical fitness we have to think in terms of general health rather than specific relationships.

Thursday Afternoon

DR. BYRON STOOKEY presented the subject "Problems in the Diagnosis and Management of the Nucleus Pulposus."

We have now had a sufficient number of cases (1500) which can be reviewed so as to give an accounting of our experience. It is interesting to note that none of the papers on the subject gives details as to end results.

It is believed that changes should be made in diagnosis and operation procedures. There is some divergence in terms (disc or nucleus) but the latter is preferable in the opinion of the speaker.

The anatomy of the parts involved was reviewed. It was especially noted that a pressure of 30 pounds can be very rapidly raised to 500 pounds. It was also pointed out that the nucleus undergoes changes due to age.

The majority of cases give a history of sudden violence and torsion under flexion is a mechanical factor in many instances.

The majority of cases occur in movable parts of the spine, also lumbar four and five and lumbar five and sacral one. The condition is most common in men, but there are differences in the ages, some occurring in the early 20's.

In diagnosis, opaque material and the injection of air into the spinal canal have both been used; the latter is not so satisfactory. A negative finding in the latter is valueless, but air of course is less costly — however there are greater difficulties in diagnosis. Lipiodal spreads considerably, even to the basal cisterns and may become enmeshed in the nerve roots. It is believed that lipiodal is being used less at the present time than formerly.

The speaker did not accept the statement that the nucleus could be sucked back into the disc. Recurrence of symptoms happens, but the explanation is not known.

There have been examples of cure and disappearance of symptoms after an operation, although the protrusion was not located.

The essayist had devised an operation to remove lipiodal by making an opening through the second sacral vertebra.

The last seven operative cases had been done without any injection and in six of these the site of protrusion was located.

In diagnosis, the following points are important: (1) history of trauma; (2) loss of lumbar lordosis, with scoliosis; (3) referred pain along the sciatic nerve, and anterior of thigh. The Achilles jerk is often absent. Rarely does one encounter atrophy. Hypotonia of the glutei are always to be searched for. Definite anesthesia has not been encountered. Tenderness of sciatic nerve and insertion of gluteus maximus are often seen.

All other measures should be tried and means should be exhausted before attempting operation. Rest in bed is usually not efficacious.

The operation used was formerly a bilateral laminectomy; later a hemilaminectomy has been used and it has been possible also to remove the hernia without interfering with the mechanics of the back, accomplished by not opening the dura. This procedure is important because there is minimum obstruction of the vertebral column, which permits of later fusion. It is often more difficult to remove the lipiodal than the herniation.

In conclusion, an excellent series of lantern slides was shown illustrating findings in different cases.

In the absence of Dr. E. Jefferson Browder, Dr. Huber Wagner discussed Dr. Stookey's paper. He believed that it was an excellent presensation, but the condition was relatively new to him. He had not been successful in locating the nucleus. It was important to so stabilize the back that the patient may be permitted to return to work.

Dr. Stookey, in closing, stated that there was no explanation as to why a bilateral laminectomy doesn't permit return to work in these cases as it certainly does in the removal of spinal cord tumors.

DR. PHILIP D. WILSON presented a most interesting discussion of "Fractures and Dislocations of the Elbow."

Such injuries are more common in children and in the present discussion we shall cover experiences in 2100 cases.

Dislocation of the head of the olecranon is most common. Condylar fractures have increased in number and are very complicated as to treatment. Even open operation and internal fixation are not as efficacious in condylar fractures as in other types — a better method is traction exerted on the condyles.

In fracture of the head of the radius, excision of the radial head may be necessary if the articulating surface is involved.

In fractures of the olecranon, stainless steel wire is used.

In dislocations, radical excision of the joint is usually required.

In the complicated problems regarding dislocations and fractures of the elbow joint, a great deal of progress has been made. The following concepts must be kept in mind: (1) the importance of the correct classification — there are great differences in the traumatic effects and therefore, treatment must differ radically; (2) operative reduction is definitely indicated in comminuted fractures of the olecranon and dislocations of the radius; (3) one must have the needed facilities for operative work; and (4) skeletal traction is of definite efficacy in condylar fractures.

Dr. Joseph B. L'Episcopo discussed Dr. Wilson's paper.

One thing we have to keep in mind is that there is a different mechanism of cause of injury in each case of this type and therefore, the cases must be individualized. The badly comminuted cases will need resection. However conservative methods rather than operation are to be emphasized, in spite of the fact that there are definite exceptions to this principle. The use of hardware should be discouraged. Each case should be checked up by x-ray and one should stay with the case until the best possible reduction is obtainable.

DR. WILLIAM DARRACH presented the subject "Shoulder Injuries."

In simple fractures of the clavicle, the principle is to hold both shoulders back which can be done by a T splint or a "figure 8" bandage. In comminuted fractures or in cases of non-union, the Kirchner wire is efficient.

In acromio-clavicular dislocations, the outer end of the clavicle rides up. This must be exposed and the coracoid anchored to the clavicle by means of fasia or tendon.

Ninety-eight percent of shoulder dislocations can be reduced by simple traction, but in such dislocations one must always consider fractures, especially of the greater tuberosity.

In complicated cases where both the tuberosity and head are fractured, it is sometimes necessary to resect the joint.

Vascular changes in the head often give trouble.

Dr. Clay R. Murray discussed Dr. Darrach's paper.

In fracture of the anatomical neck and with fractures of the tuberosities, early removal of the head or early arthrodesis is necessary.

In acromio-clavicular separation where the coracoid ligaments are torn, it may be better to use conservative measures, except where heavy labor is necessary, when early operation is very vital.

The perfect surgical approximation of fractures of the neck is not necessary — it is important to remember that we must treat the part of the body here rather than one anatomical structure. All cases require good re-educational processes started as soon as possible. Under-water exercise is one of the important types of such procedures. The results will be better in such cases if more attention is paid to the after-results than merely the restoration of outline.

Thursday Evening

THE Twenty-fifth Annual Dinner Meeting of the American Association of Industrial Physicians and Surgeons, in conjunction with the presentation of the William S. Knudsen Award for 1939-40, was opened by Dr. H. V. Spaulding, who made comments particularly regarding the twenty-fifth anniversary of the association and made mention of the various component societies.

Dr. McIver Woody, toastmaster, read a congratulatory telegram from Dr. Andrew M. Harvey.

A telegram from Dr. Thomas Parran, Surgeon-General of the U. S. Public Health Service, was read particularly with reference to the appointment of a committee on national defense from the membership of the American Association of Industrial Physicians and Surgeons. A reply telegram was also read with reference to the appointment of this committee.

The President of the United States sent a telegram congratulating the association on its accomplishments with reference to the maintenance of health in industry, wishing continued success.

Mr. Merle C. Hale, in presenting the Knudsen Award, regretted greatly the absence of Mr. Knudsen, who has keenly appreciated the part research has played in the increase in the health and efficiency of workers, which has now gained additional significance because the association has been called upon by the government to participate in the preparation of national defense procedures. Dr. Leroy Gardner has demonstrated how helpful research can be in the control of silicosis and bringing it into the field of preventable occupational diseases.

Dr. Leroy Gardner, in accepting the Knudsen Award, was greatly appreciative of the honor but rather believed that he was being honored through the work of a large group of investigators in his own organization, representing a combination of many minds and therefore, the whole group expressed their appreciation for this honor.

The research program was started years ago but assumed practical importance in the late twenties. Contacts were made in industry which it was hoped would work out mutually advantageously.

Although much has been done, there still remain problems with regard to dust in industry. Even in South Africa with the experiences over a period of 25 to 40 years, there are still problems, although conditions are much better controlled at the present time. It will, therefore, require constant attention to solve our problems and the same principle applies to all occupational diseases. Animal experiments indicate the importance of chemical means of control but these have not yet been applied to human beings.

The problem of cost really limits the application of research to the larger organizations and to the neglect of the smaller organizations through cost difficulties, which may probably be accomplished through this association. It must be remembered that industrial hygienists are asking that all dusts be reduced to minimum concentrations.

It is our responsibility to see that all physicians are correctly informed about the progress in our knowledge, else there will be misinterpretation. Undergraduate courses and postgraduate courses must be extended for the production of expert industrial hygienists. But the general practitioner will probably only have a theoretical knowledge. Reference was made particularly to Dr. Selby's idea of correlating the knowledge of the general practitioner with industrial methods.

An important point is that the informed medical witness is not liable to offer anything but sound testimony in hearings.

A review of progress with respect to the control of tuberculosis was given.

In conclusion, it was stated that the combined attacks upon these problems will probably bring more sound information.

Dr. Woody was especially pleased that the Knudsen Award had been conferred upon Dr. Gardner because he was an associate with him 26 years ago and was trained by the father of pathologists, Dr. Frank Mallory.

Since nothing succeeds like successors, Dr. Woody therefore introduced Dr. Daniel Lynch, incoming President of the Association.

Dr. Lynch deeply appreciated the honor which has been given him, realizing that 22 years ago he attended the first meeting of the association. It has grown in quantity, but most important, in quality and has had a deep influence upon the lives of men and women in industry.

Being conscious of the responsibility, he hoped and prayed to be able to carry out the standards previously set by such men as Doctors Harvey, Selby, Shoudy and Holmblad, and to be able to perpetuate the organization of today.

It was a distinct honor to be called upon by the government to participate in the national defense. No longer are battles won in war, but in industry, which must be protected. He pledged allegiance and stated that we were prepared to protect men and women behind the lines of battle.

Dr. ALLEN A. STOCKDALE, the guest speaker, felt that the mind of the country was dazed; it couldn't realize what has come to pass — our calmness of life has been threatened.

We have been saying that industry stands for peace, but now comes the time when industry must reckon with the shadows across the land. This point of view is reasonable and defensible and we want to reckon with our problems before it is too late.

In our pledge we transcend all party lines, selfish interests, and find ourselves strongly welded together.

What a price war is — how foolish — what it ruins. Our real success is due to a peace of 160 years in which there were only six wars, compared with the interminable wars carried on in Europe.

If we could only have what war costs to use in our scientific advancement!

We have been through experiences all over this country where industry has come into a small community and the community has grown around the industry. This has resulted from the cooperation of men of vision with money and men of science, that really makes for full progress.

But it must be kept in mind that we still have a challenge.

The meeting concluded with congratulatory remarks by Mr. William P. Yant, Retiring President of the American Industrial Hygiene Association.

Friday Morning, June 7

Dr. E. L. BELKNAP discussed the subject "Diagnostic Criteria in Lead Poisoning."

Comments were made upon the three types of lead poisoning, the colic types, the palsy type, and the encephalopathy type.

Considerable time was devoted to differentiation between lead absorption and lead poisoning. There may be high levels in the blood and the urine without symptoms. It is believed that a practical method of staining for stippled cells is that of using the Wright method. Such stippled cells appear first without anemia, approximately one to 12 cells per 50 fields being considered normal. Although single readings of stippled cells may not be of distinct value, real significance is attached to the stippled cell curve.

The difference between absorption and poisoning is in the appearance of symptoms in the presence of exposure. Approximately 90% of the acute cases have constipation, obstipation and colic. Lead occurs in the urine and the blood. A sudden rise in the stippled cell curve without proportional decrease in hemoglobin is often observed.

It is believed that there is no such thing as chronic lead poisoning, but that the clinical picture represents a series of episodes. It has been found that one can have 0.1 mg. to 0.2 mg. of lead per liter of urine without symptoms or damage.

In such instances, lead does not produce fibrosis as does silica. There is no increase in the blood pressure, no kidney damage or similar pathology in cases of lead absorption.

It is, therefore, believed that there is such a thing as a normal lead metabolism.

There is no correlation between the amount of lead in the blood and urine and the symptomatology.

It is important to understand that the body "keeps pace" by excretion or by storage in instances where poisoning does not occur. It is vital to understand the amount and character of the lead exposure and to correlate these with evidence of absorption and follow the clinical reactions.

Dr. Irving Gray, in opening the discussion of Dr. Belknap's paper, discussed the relationship between lead absorption and a normal lead metabolism. However, this is a different assumption from that often encountered in medicolegal work —namely that gastro-intestinal symptoms mean lead poisoning, regardless of the actual cause of symptoms.

The most important of all laboratory procedures is serial stippled cell findings. Dr. Gray agreed that there was no such condition as chronic lead poisoning.

Extensive studies on renal function show nothing definite, likewise no evidence of liver or cardiovascular effects. Approximately 1% of these persons have what may be called a paroxysmal hypertension which persists for five to 10 days.

Dr. William D. McNally could not agree with the contention that palsy or wrist drop occurs with any specific frequency. He agreed on the lack of hypertension in these cases. It was thought that the basophilic aggregation test was the better measure of blood changes.

Dr. Belknap, in closing, thought that acute infections or disturbances of metabolism occurred in each episodic picture. He wished to point out finally that palsy was quite infrequent and that encephalopathy was rare.

Capt. E. W. BROWN presented the subject "Hygiene Aspects of Welding in the U. S. Navy."

Welding practice has expanded rapidly and now over 2000 welders are used in the work in the navy. There are now 250 welders who have been used in a period of over three years in ships now building.

The nature of the work is such that it must be done in small spaces and in cramped positions.

Our interest has been heightened in welding processes since the use of coated rods was commenced. Reference was made particularly to the work of Britton and Walsh.

Hazards may result from the coating or the metals used. It should be kept in mind that the majority of the welding done is what is known as shielded arc welding.

The oxides of nitrogen are able to exert effects mostly in restricted and confined spaces and there is a delayed reaction which may finally result in edema of the lungs and subsequent death.

Carbon monoxide is produced by the reduction of carbon dioxide, but probably in insufficient amounts to cause difficulty.

Oxygen deficiency cases have occurred.

Of the metals, and other substances, lead, zinc, manganese, fluorides and silicon are encountered. Formerly lead poisoning occurred in a significant number of cases, but it has been greatly reduced. Zinc is usually unimportant. There have been several reports of manganese cases in foreign literature but none have been reported in this country. The fluorides and silicon are both considered relatively unimportant.

X-ray studies have been made in a number of instances and particular emphasis was placed on the report of Sander who had seen nodular changes in workers in confined spaces. Britton and Walsh's report is also an important contribution to our knowledge. The author reported a case of bronchial pneumonia.

Lantern slides were used to give general data on a group of 342 welders during a period of four years. However, comparisons of lost time when made with a general group, with the welders, showed little difference.

In closing, the speaker stated that the Bureau of Standards Code for Head and Eye Protection was closely followed. Air hose masks and the canister type of gas mask have been extensively used.

Dr. Emerich von Hoam discussed Capt. Brown's paper.

There is general agreement that welding is not hazardous if properly done. However, there are many spurious reports of all kinds of diseases occurring in welders without confirmation of real welding exposure.

Animal experiment have shown that dusts are more toxic than fumes and gases least toxic. Reliable information leads us to believe that there is no silica hazard involved.

DR. MARION B. SULZBERGER presented the subject "Occupational Dermatitis," and restricted his discussion to the allergic phases only.

A definition for allergy was given and its specific application to problems in dermatitis was discussed.

Statistics in Europe and the United States are in agreement that occupational diseases resulting from skin irritation range from 60 to 80% of all occupational diseases reported. The most frequent type of skin affections are eczematous lesions and of these the most frequent types are the allergic cases.

There are great difficulties in this type of work with respect to (1) the laws which vary so greatly that it is impossible to make comparative lists; (2) diagnosis, in which the host factor and the great differences in susceptibility are to be considered; (3) etiology — the quality of exposure and irritating substances, heat, cold, trauma all form a complex group of associated and interrelated factors; and (4) prophylaxis in which isolation, enclosure and selection of proper skins are necessary considerations.

One of the most difficult problems is legal responsibility and it is believed that the solution can be reached through the appointment of panels of experts to determine major causes, because of the difficulty of establishing definite relationships.

It should be borne in mind that the clinical picture of these allergic cases is not specific whatever the cause may be. Furthermore, exposures are most difficult to establish and correlate because of the very small quantities involved.

Case reports were given on dermatitis resulting from exposure to fur dyes and clothing dyes.

Selection of employees may be done by skin testing and also by substance testing, after which substitution of substances may be made for those less irritating or non-irritating.

Finally, it was shown that minute contaminants, lipstick being used as an example, are capable of causing irritation.

DR. LOUIS SCHWARTZ opened the discussion on DR. SULZBERGER'S paper.

It is estimated that there are 100,000 cases of industrial dermatitis annually. An examination of 20,000 people shows that more than 1% are affected at any time.

Various agents are contributory and there is an amazing number of such agents.

In 9000 cases, 20% were found to be allergic and this is the most frequent single factor exerting any effort.

It is believed that workers should be treated during the entire period of incapacity.

The discussant was not in agreement with preemployment patch testing as being efficacious.

Containers used for the marketing of irritant chemicals should be labeled.

Courses on industrial dermatitis as part of the regular training should be given.

DR. L. E. HAMLIN presented the subject "Silicosis."

The essayist restricted his discussion entirely to experiences in iron mining. A series of slides was shown depicting changes in the chest ranging from the normal chest through various stages of silicosis and finally over into infected cases.

Among the difficulties in this type of work is the fact that much publicity has been given to it and oftentimes erroneous conceptions have been started, resulting in confusion. In the experience of the essayist, he found it difficult to convince the man who has no symptoms that he has been affected; therefore there has been a lot of skepticism on the part of the employee who has no disability and no symptoms.

Extensive studies, illustrated with charts relative to tuberculosis in miners' families, showed the necessity for tracing the progress of the disease genealogically.

Tabulations of tuberculin tests with tabulations also of symptoms and signs on three classes of findings (previous to the contraction of silicosis — silicosis cases -- and those with complications) showed a complete lack of correlation of the findings. There was also lack of correlation on exercise tests, some of the most advanced cases reacting favorably, and some of the early cases reacting unfavorably. In this series, over 50% had stationary weight.

Of great interest was the fact that little or no progression was noted even in cases of fresh infection over a six-year period. Progression is, therefore, considered not to be the rule but what little there is, is probably due to remaining in a dust exposure which is hazardous.

It was particularly emphasized that among the older men in this series of employees there were no changes suggesting degeneration and they seemed to be in good physical condition.

DR. L. U. GARDNER opened the discussion on DR. HAMLIN'S paper.

The community tuberculosis problem makes silicosis in such a community a more trying situation.

The results of the exercise tests in the experiences cited by DR. HAMLIN are not uncommon.

It is extremely difficult to evaluate the significance of tuberculin tests.

There should be more sputum examinations done in silicosis studies, as have been done in this one.

Finally, the observations made in this study regarding progression establishes the necessity of realizing the great chronicity of these types of cases.

Friday Afternoon

DR. ARTHUR M. MASTER spoke on "Effort and Trauma in Coronary Occlusion and Insufficiency."

It is important to determine the relationship of trauma and effort to coronary occlusion and insufficiency because it has become an industrial problem.

We must distinguish between angina and coronary occlusion — there is no anatomic change in the former and the use of the latter term should be

restricted to infarction, whereas coronary insufficiency does not involve occlusion.

In differentiating between angina and coronary insufficiency and occlusion, it is believed that the first is more of a functional disturbance and that the latter two are really pathological.

Regarding the role of effort in the production of the attacks, in a series of 1620 cases of occlusion, only 2% were found to have a history of severe exertion during the onset of the attack. Occupation is not a real factor as demonstrated by tabulations shown on lantern slides. Intimal hemorrhage is really the effect of arteriosclerosis.

With regard to the association of trauma and these conditions, commotio cordis can stimulate insufficiency. Trauma is capable of producing damage, but is incapable of producing the real picture of coronary disease. The number of cases which have been reported in the literature as such, are not really due to trauma, although it has so been assumed. The preponderant opinion, therefore, is that the association is coincidental.

It was concluded that coronary occlusion and insufficiency are not related to any external event but are rather the result of internal pathological processes.

DR. ROBERT L. LEVY, in discussing the presentation of DR. MASTER, believed that we are not to assume that because a thing is somewhat rare, it doesn't occur. A number of cases of coronary disease were cited as following effort. Each case must be judged on its own merits.

DR. IRVING WRIGHT presented a paper on "Trauma and the Peripheral Vascular System." Constitutional makeup is very important. Careful workup is necessary and usually gives evidence of difficulty.

A case history was cited in which the differential diagnosis was quite difficult. Tests were made under anesthesia without substantiating vascular disease, but pressure on the foot continued to give a pain reaction. Further tests substantiated a diagnosis of pressure on the spinal nerve roots.

Another case history of injury to the hand, involving the severance of vessels, nerves and tendons was cited. Tests showed a high oxygen content of the venous blood substantiating an arteriovenous connection which may in itself be the cause of heart failure. In such instances, a rich collateral circulation is established and therefore such a large anastomosis can be removed, surgically. An instance was also cited of popliteal aneurysm. Pressure was due to trauma.

Primary venous thrombosis has been seen in garage employees and others who use arms and shoulders rather frequently.

Disturbances from the use of pneumatic hammers and drills should be called spasmodic vascular diseases. In such instances, the fingers are exposed to trauma over many years of time and consequently Raynaud's syndrome may result.

A careful survey of the whole body should be made in these cases.

Summing up, the practical complications as a result of industrial life are so many and varied as to defy classification. The whole group of possibilities needs careful checking. It it hoped that the material presented may be useful as a guide.

DR. GILBERT MARQUARDT discussed DR. WRIGHT'S paper. The starting point in these cases is early simple inspection and palpation which will give much needed and valuable information.

In a series of cases, the arterial output was measured after arm injuries and was found to show considerable decreased arterial circulation.

One should always be on the watch for accessory factors, such as, for example, calcification of muscular tissue. The establishment of collateral circulation is a factor of time elapsing after the occurrence of trauma or pathology.

DR. JOHN SCUDDER presented an interesting discussion and demonstration of "Shock."

This work goes back to the fundamentals established by Robert Boyle, who measured the specific gravity of the blood. The specific gravity is increased in shock, hours before any fall in blood pressure, thus providing the advantage of beginning treatment when it is most effective.

In case of cholera, for instance, mortality has been reduced from 80 to 30% by the injection of sodium chloride solution.

If we consider shock as a stagnation of blood plasma in all capillary spaces of the body and not just in the abdominal areas, this is a better concept of the real condition.

Four simple tests and apparatus for the making of them were described.

First is the hematocrit test which involves taking 6 cc. of blood in a graduated test tube marked out in cc. and adding 1 mg. of purified heparin, placing the tube in a centrifuge where it is rotated to 2500 revolutions per minute. In cases of emergency the time of centrifuge may be limited to 15 minutes. From this test, one can evaluate the percentage of cells in the bottom of the tube as compared to the plasma on the surface, giving a definite picture of the amount of concentration or lack of concentration of the cellular elements. The average is 46% cells and 54% plasma for males and 41% cells and 59% plasma for females.

The next test involves getting the specific gravity of the plasma. This is a special procedure which involves the use of an apparatus designed to release a single drop of plasma into a cylinder which has a specially prepared fluid in it. By timing the drop of plasma within the fluid between certain marked off levels, by a stop watch, the specific gravity may be computed. It has been shown that the inorganic salts remain constant and therefore, any change in the specific gravity will depend on plasma proteins.

The third test is the determination of specific gravity of the blood by the same means used as in the case of the plasma, but this is necessary only where one does not have the plasma to analyze and may be obtained from blood from the fingertip.

The fourth test is the determination of plasma protein which can be worked out by a simple formula, using as a basis the figure obtained on the specific gravity of the plasma. The average plasma protein content is 70 grams per liter or 7%.

By means of the above findings, one may determine the degrees of water loss, water plus protein loss; differentiate shock due to simple circulatory collapse from shock complicated by hemorrhage; detect dehydration in the presence of anemia, and predict the approach of an edema level of proteins. Thus, from these findings one may more rapidly direct treatment for the alleviation of these conditions.

Dr. George M. Piersol discussed Dr. Scudder's presentation.

Comments were made on various theories relative to the cause of shock from the beginning down to the present time of our present conceptions of shock on a biochemical basis.

Dr. Scudder, in closing, stated the importance of being prepared with a blood tank, or the ability to transport plasma.

DR. FRED H. ALBEE concluded the session by presenting his paper on "Bio-physiological Relations of Treatment in Fracture on the Neck of the Femur."

This fracture has been designated as an unsolved problem recently.

From figures obtainable in Great Britain, there were 22% positive results; the American figures as a whole show 30% results, New York figures in two different series show 38 and 40% respectively with regard to unions. In 20% of cases, it was shown that there was aseptic necrosis of the head.

In 20% of instances, there was no appreciable circulation in the ligamentum teres. The circulatory conditions are entirely different from that of any other anatomical relationship with regard to the treatment of fractures, hence the difficulties presented. It was found, for instance, that in a series of 448 cases, in only two was the ligamentum teres intact.

The essayist prefers a bone graft peg in treating this type of fracture because of the distinct help it gives in developing collateral circulation.

There has been a great deal of enthusiasm about the use of vitalium, but the essayist stated that he was now taking out more vitalium screws than those of other types. Such screws get loose, and can be pulled out without difficulty. Wires and nails are also being removed in many instances.

Again it was emphasized that it is important to use a bone peg in order to establish circulation in the head, which otherwise would cause an aseptic necrosis, with the difficulties that follow such a change.

The meeting closed with the introduction of the new President of the Association, Dr. Daniel L. Lynch, who made brief comments in looking forward to a great year of service and a stewardship which he hoped he would deserve.

President's Address

McIver Woody, M.D.,
President, American Association of Industrial Physicians and Surgeons; Medical Director, Standard Oil Company of New Jersey

AFTER five and twenty years, the American Association of Industrial Physicians and Surgeons meets once again in the shadow of a great war. Now, just as in 1916, the military powers of Europe are locked in a life and death struggle, the outcome of which no man can foretell. This much is sure, no matter who wins in the end, medicine as a profession will never be quite the same again. Medical books will have to be rewritten, and the rules of the medical profession may have to be revised, for socialized medicine will be upon us if a totalitarian government should prevail.

The only certainty in life is the certainty of change, and our gravest danger is that the necessay changes may be brought about by violent and destructive revolution, rather than by the gradual and less wasteful processes of evolution. Naturally our sympathies, as men of science, lie in the latter direction, for we fully appreciate the advantages to mankind of an orderly advance towards a higher civilization.

Industrial physicians are vitally interested in the present situation abroad, for, as medical men, they are members of a profession which is singularly free from chauvinism. Medicine is unusually international in its scope. In the legal profession one's horizons must be, to a considerable extent, so limited by the statutes of one's state and by the laws of one's country, as to hamper the free exchange of ideas with one's professional brethren across the seas. Religion, too, during the last 400 years has come to differ in doctrine and in belief, one faith from the other. But the human body does not change. It is the same the world over, black or white, Judy O'Grady or the Colonel's lady. It is subject to the same malformations, the same new growths and, to an increasing degree, the same infectious diseases.

Differences in race and language do not really impede the free exchange of medical knowledge. Thanks to our many medical journals, a new vitamin discovered in Hungary may within a few months be synthesized here in America; a new cestode found in the intestine of a man in South America may have its life cycle worked out in London. Thus, so long as *homo sapiens* walks the earth (and evolution is always forward, never backward) medical knowledge will be much the same the world over. We, as scientists, will always have countless problems in common with our confreres of other nations, whether we be at war or at peace with them. A medical profession worthy of the name, must be international in scope.

Of course it is in this country and in the devel-

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opment of industrial medicine here that we are most vitally interested, and yet as advisers to management on medical questions, our interests must be as broad as those of industry itself. Even if we doctors wished to do so, we could not insulate ourselves from the turmoil and change going on in other countries which are so affecting our own. If we are to be of real use to industry, we must have some regard to the environment in which industry operates; we must be aware of the fact that a new and cheaper source of raw material discovered on the other side of the globe may have a profound effect on a whole branch of industry here at home; that remedies and new ideas born of front-line emergency needs, may change accepted techniques in a few short months.

We industrial physicians must be ever alive to the changing currents of world affairs; indeed we cannot limit the range of our reading to the medical journals of one country, or for that matter, of one language. We must, to an exceptional degree retain international scientists, if we are to keep industrial medicine up to date and keep in tune with our times.

Ten years ago, a leading authority on occupational diseases spent several months in this country and visited a large number of manufacturing plants. The very questions he asked showed that his interests ranged far beyond mere toxicology. What he admired most, was the progress we had made in "rationalization" or as we would say, "the technique of mass production." In addition, the high standard of living which our workers enjoy, impressed him tremendously. Only within the last few months have I heard indirectly that, in patriotic fashion he has placed his expert knowledge at the disposal of his country, and has made himself indispensable to the party now in control of his native land. And yet, I know that underneath all his devotion to his nation there still remains something of the international scientist, and that some day, whether he stands with the victor or the vanquished, he will again recognize his present antagonists as his professional colleagues, and from out the chaos of war, he will develop some new method of prevention or cure to be used by friend and foe alike, for the benefit of the worker in industry.

As outworn customs and privileges that no longer serve a useful purpose, are broken and discarded, a new world order will arise, more efficient and less wasteful than the past has ever known. After the storm of death and destruction, scientific medicine should take on new and vigorous growth; for medicine is sensitive to world conditions to an unusual degree. It is no accident that Ramazzini was a product of the Italian Renaissance, that Tanquerel des Planches belonged to the Napoleonic Empire, Kussmaul to the First Reich. All these investigators were men of their time, alive to the industrial diseases they came across in their daily work, and eager to do what they could to benefit their fellow men. To such as they, we owe our present store of medical knowledge.

Today, we industrial physicians have a unique opportunity to serve both science and humanity. What is more, we have at our disposal not only the special knowledge of occupational diseases which has been accumulated over the past 300 years, but we can also offer the men who come under our care the benefits of modern surgery, the protection of modern epidemiology, the encouragement and comfort of modern psychiatry. In addition we enjoy the confidence of enlightened management which welcomes any and every scientific advance that is made in industrial medicine. The enlightened employers of labor know that the industrial physician can be a money-saver as well as a pain-killer.

AND so, after 25 years of gradual growth, during which this association has become a seasoned organization with traditions that reach back to the beginnings of industrial medicine as a speciality in this country, we again find ourselves in a period of transition. Founded by a handful of forward-seeing men, this association now has a hundred members for every one it had at the beginning. In addition to its regular annual meetings there are frequent gatherings of the component societies, all devoted to reports of new advances in industrial medicine, as well as to the successful applications of them in practice. Now that the parent organization has a membership equal to nearly 1% of all the physicians in active practice throughout the country, its future would seem to be secure, provided that it measures up to the needs of the hour.

Not that numbers in themselves are important, but it is a great gain when non-medical men, interested in benefitting industry, feel the need of joining hands with medicine for mutual strength and help. Professional ability and social consciousness of the Association of Industrial Physicians and Surgeons remain as high as ever, for only by the addition of able doctors, consecrated to their profession, can industrial medicine hope to aid industry as it should. And, after all, if it does not serve industry well, it has no right to exist.

To my mind there is something prophetic in the circumstance that our patron, Mr. William S. Knudsen, the donor of the Knudsen award, has been called from the presidency of one of our greatest manufacturing organizations to the nation's service on the newly organized Advisory Commission. That Mr. Knudsen deemed it wise to show his confidence in industrial medicine as an important factor in industry, by offering such an Award, is gratifying. Indeed it should stimulate our own desire to be of service, not only to employee, but to employer.

How the present war will affect industrial medicine I do not pretend to know, but I am certain that industrial medicine will become broader, more useful, more helpful to the private practitioner as it finds the sick man and sends him to his own doctor for treatment. Whether the Allied or the Central Powers win this war, whether there is

a United States of Europe or a dictatorship of conquered nations, sick men must be made well, and well men kept that way. In a mechanized state where men function in large groups, in camp, on the march, or in devastated cities, the need for doctors versed in hygiene and the health of the individual, is important. The industrial physician has ahead of him the greatest test he has ever been put to, not of patriotism, that I take for granted, but of his medical ability, his tact and his philosophy.

Though none of us know how this war will end, history teaches us that a contest for survival between two civilizations will result in the victor being the country whose people have lived most efficiently. Surely, under this conception of victory, today's warfare is but a continuation of the First World War. Only this time the question at issue stands revealed in all its starkness. On one side are two great empires, both of which represent liberal traditions, as we know them; and on the other side are the great totalitarian states whose leaders give lip service to democratic principles, but whose doctrines and practices differ from ours as Heaven from Hell. In a word, it is the old, old struggle between Athens and Sparta, only this time, God grant, it will not prove to be a war of extermination which leaves both sides crippled and unfit to proceed with the business of living, all progress stopped and civilization vanquished.

While we Americans are yet free to act individually as well as a nation, may we give thanks for the progress that industrial medicine has already made, and to those great men who have made this advance possible. May we as individuals and as an organization stand ready to give advice to industry or to our government on matters of medical policy, in which our special knowledge and experience may be of help. Only in this way can this Association play a worthy part in the present crisis.

Industrial medicine is on trial, and its doctors will no doubt be called upon to heal the wounded bodies, soothe the tortured minds of thousands broken by the war machine abroad and tossed ruthlessly aside. We are not at war, no, not yet, but the effects of the war are already being felt in every factory and office in our land, both physically and mentally. Whether these people can be restored to usefulness as workers in industry, whether they must be hospitalized or placed on relief, only the trained physician can know. Production must go on regardless of human suffering. The little man is but a cog in the wheels of industry while he is well, but ill of an infectious disease he is a potential menace to all with whom he comes in contact until he is found, isolated and cured. Would that we doctors could cure nations duped by delusions of grandeur as often as we can the individual.

THIS meeting marks an important anniversary for the Association of Industrial Physicians and Surgeons, for it is just 25 years old. Having passed out of a long period of adolescence, it is now adult. Let us, as industrial physicians prove that we too, are truly mature, prepared to face reality with unwavering courage and the infinite resources of our calling.

Many of our classmates and colleagues died in the last war, caring for the wounded, under fire. Nothing I can say would be worthy of them, so may I close, using the words of Abraham Lincoln, the Great Emancipator: "Let all of us here dedicate ourselves to the great task remaining before us, that from these honoured dead we take increased devotion to that cause for which they gave the last full measure of devotion, that we here highly resolve that these dead shall not have died in vain, that this nation under God, shall have a new birth of freedom, and that government of the people, by the people and for the people shall not perish from the earth."

The Knudsen Award

Leroy U. Gardner, M.D.,
Director, Saranac Laboratory for the Study of Tuberculosis

IN MAKING this award you are honoring through me the whole group of investigators at the Saranac Laboratory whose work it is my privilege to correlate and publicize. Our program, which started with an academic interest in the effect of industrial dusts and their influence in the susceptibility to tuberculosis, assumed practical importance in the late 1920's and early 30's. When American industry became aware of the hazards that it had been unconsciously creating we were in a position to offer practical advice and assistance in solving some of their health problems. The contact, we hope, was mutually advantageous. We were enabled to develop special facilities for intensive study of the factors responsible for respiratory disease. For the first time we came into direct contact with members of this organization who deal with the practical problems of diagnosis and prevention of disease. You have taught us where to direct our investigations and kept us from drawing unsound conclusions from the highly artificial environments that we have created for animal experimentation.

Today there are still problems in the field of dust diseases that remain to be solved. While we believe that the application of tested and approved methods have greatly reduced the hazards we should not be too sure that our success will be complete. Even in the Rand Gold Mines, where an increasingly rigid program of control has been in force for nearly 25 years, silicosis still develops at a rate of slightly over seven per 1000 men employed. The number of cases maturing in any year is greatly reduced and it now takes over 18 years of exposure instead of 10 or 12 to produce

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demonstrable evidence of the disease, but nevertheless silicosis has not been completely eradicated. Few American industries will have to contend with the difficulties existing in these unusually deep mines but it is well for us to remember that constant supervision must be maintained if we are to stamp out silicosis and related conditions.

Animal experiments have demonstrated that the toxic action of silica on living tissue may be neutralized by chemical means. These promising leads should be followed up to learn whether the protection is permanent. We may experiment cautiously on human subjects employed in plants where accepted principles of silicosis control will be rigidly enforced. I do not believe, however, that present knowledge justifies exclusive reliance on such methods. There is danger that the lower cost of chemical means of prevention may tempt plant managements to relax their vigilance.

This problem of cost is one that has limited the application of accepted methods of prophylaxis to the larger industries. You are all aware of the current agitation for similar protection in the smaller plants and of the difficulties that are involved. Apparently some form of governmental supervision and control is the answer although it is possible that collective action by trade associations might provide the necessary control personnel.

The probabilities of serious damage from industrial dusts whose injurious properties are still unrecognized are not as great today as formerly. Industrial hygienists are now insisting that atmospheric concentrations of all dusts, regardless of their composition, be reduced to agreeable limits. With our eyes open to possibilities, it seems unlikely that any appreciable number of men will be exposed to harmful materials for very long periods.

At the present time we are suffering from the over-enthusiasm that is bound to follow any widespread campaign of education. All physicians and probably most laymen have heard of pneumoconiosis, silicosis and asbestosis. They know that these conditions are caused by inhaling dust in occupation and manifested by the presence of abnormal shadows in a chest roentgenogram. In an age when almost everyone, well or sick, sooner or later has a film of his chest it behooves us to see that all physicians are acquainted with the processes likely to produce pathological changes. If this is not done doctors will continue to attribute almost any unrecognized shadow in the roentgenogram to an occupational factor.

What direction should our program of education follow from now on? The time honored methods of medical education have only a limited application in a field that lies outside the professional school, the hospital ward and the clinic. Future graduates will undoubtedly leave school with more interest in industrial environmental factors than the doctors of past generations. Postgraduate study in universities, factories and mines will produce the experts needed to control the hazards of large organizations. Some men with initiative and a sound medical background will continue to train themselves as expert industrial hygienists as most of you have done. But I do not believe that the general practitioners of our own time or those of the future can attain more than theoretical knowledge of industrial practice without personal guidance.

Of all the proposals that have been made, I believe that Dr. Selby's system of cooperation between plant personnel and the local physician most deserves attention and emulation. As most of you know it is his policy to invite the general practioner to see for himself the conditions under which his patients work. The doctor comes to know that the foundry in his town is not the dirty, dusty workplace that he pictures from his medical reading. He learns what is actually meant by chipping and sandblasting and how men can be protected against dust created in these processes or he learns that spray painting need not involve a respiratory hazard. After such a trip he will better understand his patient's account of working conditions. With a background of personal knowledge, he will cease to jump at conclusions but use as much intelligence in obtaining and evaluating the history of occupation as he does in the rest of his examination.

I am impressed with the contrast between such a policy and that of a large corporation with which I recently came in conflict. I had asked permission to take a photograph of a conveyor belt, explaining that I wished to get an illustration of one of the dust-producing processes for a medical exhibit and that nothing in the picture would identify its source. The request was refused. While this incident may seem trivial it is representative of most of the dealing of this concern. Their own distrust breeds distrust; contentiousness and litigation seem to be one of their major activities.

By intelligent cooperation with physicians industry could not only help them to practice better medicine, but it could avoid the consequences of ill-advised medical testimony. Doctors, like most other human beings, are prone to express opinions on subjects of which they have little exact knowledge. The informed medical witness is less likely to offer the absurd but damaging testimony heard so frequently in our courts today. Knowledge makes him cautious and willing to admit, for example, that a man may have spent years in a dusty plant and still show no abnormalities in a chest roentgenogram.

As the campaign of education has thus far succeeded in giving most physicians a little knowledge, it has also aroused the interest of the general public. But it now becomes necessary to combat the belief that most industry is exemplified by a Gauley Bridge tunnel or a Picher mining district. The public would be impressed if it knew of the elaborate programs of health control in many plants. By starting at home with inspection tours for the citizens of the communities, much could be done to complete the job of gen-

eral education and to create a more sympathetic understanding.

THE problems that I have discussed are ones with which we are well acquainted but it still remains for us to disseminate and apply available information. Many other diseases are being charged to industry; I cannot consider all of them here but will point out a few created by loose thinking about tuberculosis, the condition with which I happen to be most familiar. It is easier to incriminate the environmental factors of the workshop than those of the home or places of amusement because the former have been studied and defined. This tendency probably results largely from the habits acquired in dealing with the pneumoconioses and from a lack of accurate information.

Certain generally accepted observations on the causation of tuberculosis seem to have been forgotten when we think of this disease as an industrial problem. It has been quite generally agreed that children are not often infected heavily enough to produce clinically significant effects without prolonged and intimate contact with an open carrier. It is also accepted that adults are more probably resistant than children. Even when there are undetected carriers in a plant their contacts with fellow workmen are occasional and not often intimate. The frequency of actual infection in places of work remains to be demonstrated. Because not all persons exposed to infection acquire it, we have postulated accessory factors that depress the natural resistance of those who succumb. A generation ago it was poverty, poor housing, dietary deficiency and mental stress that were held responsible for this lowering of resistance. We also revived the older doctrine of inherited tendencies and in modern phraseology proclaimed that for some persons the genes had provided tissues that would not support tubercle bacilli. None of these factors is tangible and their influence is appreciated chiefly by statistical analyses of different population groups.

The discovery of a specific factor whose effects were manifest not only on individual human subjects but were reproducible in the laboratory gave new direction to our thinking. Silica dust was proved to be a poison whose action on the tissues produced a medium on which tubercle bacilli

Presentation of the WILLIAM S. KNUDSEN AWARD for 1939-1940 to DR. LEROY U. GARDNER
Left to right: MERLE C. HALE, Director of Executive Personnel of General Motors Corporation, who made the presentation on behalf of MR. KNUDSEN, President of General Motors; DR. McIVER WOODY, President of the American Association of Industrial Physicians and Surgeons; and DR. LEROY U. GARDNER, Director of the Saranac Laboratory for the Study of Tuberculosis

thrive and multiply. The popular mind, however, could not differentiate between silica dust and other varieties. Years of careful investigation were necessary to prove that this was not a common property of all inhaled dusts and even now tests must be made to demonstrate whether new materials favor implantation and growth of tubercle bacilli. No other has yet been discovered which acts like silica.

By similar reasoning it has been assumed that exposure to irritating fumes and gases must result in inflammation of the lungs and that such reaction will in turn favor the growth of tubercle bacilli. Here again opinion is not supported by reliable evidence. We lack accurate information on the degree and type of pulmonary reaction following prolonged exposure to these irritants. It is taken for granted that the hypothetical inflammation which they cause provides a favorable medium for tubercle bacilli and makes them spread. It might be well to recall, however, that inflammation is the mechanism by which nature combats an invasion of these organisms.

What is the origin of this common belief that an inflamed area is a good medium for tubercle bacilli? Possibly the concept was suggested by the focal reaction to an overdose of tuberculin. This phenomenon is manifested by inflammation and is sometimes followed by spread of the disease. However the irritant in this case is a specific one and in addition to the obvious inflammatory changes, tuberculin possibly influences the bacilli themselves and the caseous material in which they are embedded. There is abundant proof that other irritants do not have the same influence upon latent tuberculous lesions. The case of different forms of pneumonia offers a striking example of such variation. Lobar pneumonias generally resolve without affecting coexistent tuberculosis; the pneumonias that complicate epidemic influenza, on the other hand, are much more prone to reactivate a quiescent focus. In both instances the superimposed disease produces severe inflammation of the lung, but in only one is it of consequence in this connection. These illustrations demonstrate that it is not inflammation per se that influences the tuberculous focus; it is the kind of irritation that causes the inflammation. We cannot generalize but must investigate the influence of different irritants before concluding that any one of them adversely influences the course of concommitant tuberculosis.

I have drawn my illustrations from only one of the respiratory diseases for whose causation industry is blamed. There are many more of them that involve the lungs as well as other parts of the body. The combined efforts of management, industrial hygienists and experimenters applied in the same way that they have been to the problem of pneumoconiosis should lead to a more intelligent appreciation of these conditions. Our objective must be to learn whether it is the industrial factors or those operative during the two-thirds of a man's life spent at home or seeking recreation that are responsible for these diseases.

The Problem of the Industrial Back Case

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BY THE title of this paper I shall attempt to discuss the entity known to the industrial surgeon as a "sprain of the low back." In the past, various authors have classified the sprains by the location of the symptoms, such as lumbo-sacral or sacro-iliac. In our own Clinic we have a very simple classification, all coming under the general heading of "low back sprain" and then further classified as sprain of the ilio-lumbar, the lumbo-sacral or sacro-iliac regions. Very often, because of the general involvement of the ligamentous structures, one cannot definitely differentiate between one or another, or between a combination of two or more. It is supposed that before one can approach this question he has a knowledge of the normal anatomy of the parts entering into the formation of these joints, together with the surrounding soft parts and their relation one to another. This we shall take for granted.

The diagnosis of these cases from the general into the specific classification is of paramount importance. Although often the patient will diagnose his own case of a sprained back and comes for treatment only, we believe a short and accurate history should be taken by the examiner. One attempts to obtain just what happened when the patient experienced his pain, where it was located, what kind of a pain—was it dull, stabbing, etc.? Was it localized or referred? What position was he in and what did he do immediately afterwards, until the time we saw him? By this line of questioning one can visualize the position of the patient and hence the mechanism of production of the injury. Then we go beyond the accident and ascertain what his habits had been prior to the time of injury, paying particular attention to his previous work record, the type of work and the muscular action involved, and whether there had been previous accidents.

On physical examination the patient is completely stripped and a thorough examination of the part is made. I shall omit the details of this procedure as it has been so thoroughly described, depicted and discussed in the various textbooks and is known to all. However, we feel that many of the signs and symptoms of these conditions have been over-elaborated. The textbooks and monographs on the subject usually give rather clear cut descriptions of the signs and symptoms of each, however, in my own practice I am often indefinite as to just what structures are injured and hence am not sure as to the positive classification.

Sprains of the low back might be precipitated rapidly or they might come on slowly. In the precipitated types one usually sees a laborer who has

been doing the same type of work daily for a period of months or perhaps years, when suddenly he is called upon to make an extra heavy lift, he sets his muscles to do so, he is putting forth all the effort that he can, his muscles are ready for a certain amount of strain, his foot slips or there is an unexpected twist and an extra load is thrown on the muscles. They can't hold, they let go and oftentimes with them the ligamentous structures, which after all act only to check or limit the range of motion, they cannot bear the strain of the heavy load and they too are involved. If there is an associated subluxation, and induration or effusion follows, temporarily as it might be, oftentimes we get an associated nerve involvement. It is extremely hard to visualize or evaluate as to just what structures are involved, however, after thorough study, one can come to a fairly accurate conclusion within his own mind. Very often it is an impression rather than a definite diagnosis. (This may be an admission of weakness but that's the way I feel about it.)

The other type of back injury or that which comes slowly is found in an individual who is industrious, and there are some left, the man who takes his work seriously, has an extra heavy lot of work to do which does not require any particular excessive lift. He has been able to do this six, eight or 10 hours at a stretch, then is sometimes called upon to prolong this task or perhaps do a little heavier task and he does this, gradually tiring, and his muscles after prolonged effort of a more or less minor nature become fatigued and their elasticity is lost and they let go or are stretched or torn. This might also be associated with the added factors of ligamentous and nerve involvement. If we picture the two different types of individuals and bear in mind the picture of just what might have happened when the sprain came about, I believe it will help in making a better diagnosis. If there is a referred pain through the sciatic nerve one can, within certain limits, designate the nerve root that is involved and by recalling his anatomy, can also help to make the picture complete as to what particular part of the joint was involved, whether it was lumbo-sacral, ilio-lumbar or sacro-iliac, or a combination of two or three. With that picture in mind and impression, or the diagnosis made, we attempt the treatment.

THE treatment of these cases is divided into primary and secondary, with little or no dividing line, as both are essential, as the patient primarily wants to be relieved of his pain. In the acute cases in which we believe there is only a muscular involvement, it has been our endeavor to keep these people more or less mobile. We ask them to keep going; we help their immediate pain by some sedative, such as aspirin, codein or a combination of the two. They are also given the various electrotherapy agents and particularly infra red ray which gives relief of pain during its application, and we follow this up by massage, both by hand and through the passive contractions of the muscles involved by use of the Morton Smart machine. We feel that if the muscle alone is involved, as often happens in people of lighter occupations, as the housewife, office-man, the golfer or the average laborer who inadvertently makes an awkward lift and gets a sprain, these usually are of a lighter nature, involve only the muscles and hence are easier to treat. Our rationale is this, by keeping up the normal tone through exercising the muscle we help to milk out the effusion and the hemorrhage that must occur in these muscle sprains. How much takes place is a rather hard thing to say, as I know of nobody who has ever had the privilege of seeing it directly or by pathological study. But certainly from the tenseness, the general tenderness and muscular spasm, there is a certain amount of edema and exudate that occurs in these muscles. In those patients as to whom we feel certain that there is an involvement of the ligaments, we believe that, to relieve the immediate pain, fixation is necessary. This is done by putting the patient to bed on his back on a firm mattress, with hyperextension by placing a slumber pillow or sometimes a well padded sand-bag beneath the small of the back, and giving sedatives; morphine being used generously until the acute pain is over. Then, as the patient can and will, we attempt to bring about a physiologic reaction in the muscles by the method as has been described before.

IT HAS been our idea that in fixation of these backs by plaster casts, such as are very frequently used by various members of our profession, one does these patients more harm than good. By plaster casts the part is fixed, the strain is taken off the ligaments and muscles and in so doing an atrophy of the muscles readily takes place, so that when the patient is relieved of his cast, one has to re-educate the muscles back to their normal activity and develop them to normalcy and this over a prolonged period of time. We know how readily the muscles of any active man atrophy by disuse. We see it even in youth, in an active baseball player, a football-player, but it takes place more rapidly in a man beyond the youthful period and the majority of our cases are in this type of person, i.e., the man of middle age.

In our examination if we have any reason to believe that there has been an associated injury to the osseous structure or joints, such as a subluxation, we call on the roentgenologist to give us all the help possible. In the average case there is very little that one can see in the x-ray films. However, from a point of medical jurisprudence for our records, an x-ray is usually made, the exception being mostly for economic reasons. Ninety-five percent or more are negative and the so-called subluxations, torsions, etc., as reported seen in these films are, to my mind, more imaginative than real. True, this region of one's anatomy shows many anomalous developments. Various roentgenologists who have made special study of this region and others who have reviewed their work quote various figures as from 30 to 85% of

the backs examined showing some type of deformity and malposition. Hence, aside from the x-ray findings concurrent with spondylolisthesis, I believe we should be slow in attributing these anomalies to predisposition to injury and especially to sprain.

By thorough cooperation and discussion with the roentgenologist, a correct interpretation of the findings can be had.

Over the past year and a half we have been treating our acute cases by nerve injections, using sarapin and eucupin alternately at first, and later using sarapin almost entirely. This was done at the instigation of a colleague, because of his enthusiasm for this treatment and to check his results. All acute cases were treated regardless of their severity, i.e., whether we felt the muscles alone were involved or whether a combination of muscle and ligament or muscles, ligaments and nerve roots. Our records show that in about 12% of these cases we had excellent results. By this I mean the patient continued his usual work. In another 25% we felt the patient was relieved of his pain, but had to have other treatment, and in 63% we had unsatisfactory results. Broadly speaking, we did not get the results reported by others and not the results expected or hoped for, but we feel we have an adjunct to our usual treatment. In all, we have treated 60 patients by the injection methods, sarapin 27; eucupin 14; eucupin and sarapin 19.

THE most recent diagnosis of the cause of low back pain, especially when referred along the distribution of the sciatic nerve, is the so-called herniation of the nucleus pulposis of the vertebral disc. I mention this only to add a word of caution before one makes this diagnosis. Certainly it should be made only after all usual treatments have failed and after thorough study with the cooperation of the neurologist and the roentgenologist, following air injection in the spinal canal. Operation for relief of pain might be a necessity but does it cure so that the laborer can return to his work? One could discuss the question pro and con at length. I do not deny the entity but I question its frequency as recent literature would have us believe, and I must be shown the efficacy of the operative procedure as a cure.

In those cases of low back pain or sprain that have not responded to early treatment of injection and mobilization, fixation or other therapeutic measures and have been allowed to become chronic, we have another method of procedure. In these chronic cases one finds the patient, regardless of location of the lesion, complaining of pain on any movements whatever that call for a flexion of the spine or involvement of the erector spinae muscles beyond a very short range of motion. The pathological lesion here involved we feel is a general fibrosis in the muscles, muscle sheaths and in and about the ligaments following the organization of the effusion and hemorrhage that takes place in the ordinary sprain. To overcome this we believe that it is necessary that these muscles be put through a normal range of motion in a passive manner, hence manipulations of these backs are carried out under pentothal anesthesia after the method of Bankart. By manipulation we lengthen the muscle that has contracted, this permits full motion and is again followed by a certain amount of edema, effusion and induration. Immediately following the manipulation, after the patient responds from his anesthesia, in which we have used pentothal exclusively for the past three years, he is immediately started on the routine of active and passive use of the muscles involved, with applications of moist heat (artificial fever therapy — local unit) or infra-red rays at one, two or three day intervals as indicated. If in some of these cases, after a prolonged study and attempted rehabilitations (one to two years) by various treatments and methods, we fail, then I think one must consider the possibility of fusion or stiffening of the joints involved, if sufficient x-ray findings support the same. In the sacro-iliac joints, these to a certain extent, have been fairly successful. I believe however, that it is mostly indicated in the lumbosacral region, but this is justified only after all the other treatments have failed and the patient can only be given relief by the application of a proper fitting brace; remembering that if you once do an operation for fusion on a patient without relief, you not only have a patient that is with you forever, but usually a dissatisfied one.

GENERALLY, there is a bad psychological reaction associated with these sprains. We usually find them in an individual whose education oftentimes has not been the best and when once injured he immediately begins to worry about his future. Because of the unsatisfactory results in the past with these cases, the patient is aware of the possibility of prolonged disability, which is general knowledge. And, together with the admonition of kind friends who always paint the picture black and tell of another case that had gone on with prolonged disability, we have considerable trouble to have the patient understand our methods and rationale for the same, and often poor or no cooperation.

I think another factor always worthy of consideration is the economic one. When times are good we find we can rehabilitate our patients much easier than when they are bad. Since the rapid changes in the labor situation, generally speaking, as soon as a man is hurt he has an adviser from among his associates. The advice given is not always to the best interests of the patient. They are advised to make sure they are completely well before returning to duty as once off compensation it is difficult to get back on and after a back injury (sprain) they are quite liable to ready discharge. These facts are true and it is not my prerogative to say who is to blame, but because of the struggle it has almost become a case of survival of the fittest. This attitude now brought about has, to a marked degree, materially affected the efficiency of our treatment. I believe

if we are to get more of these back cases well, we must have the full cooperation of the employer as well as the employee. From my experience, I am sure in the majority of cases that the employer is cognizant of the fact that these patients who have once been injured must be gradually rehabilitated to a percentage of disability, or to full productivity, where the best results are obtained. I find also that where the employer is self-insured, this particular picture with cooperation is more easily obtained. On the other hand, where the insurance is carried by an outside company, the employer oftentimes takes the attitude that it is the duty of the insurance company to carry the burden when an accident like this happens and he is often reluctant to cooperate in any way.

Naturally when this attitude is taken, whether consciously or sub-consciously, it is reflected through the doctor to the patient, and a certain resistance or lack of cooperation on the patient's part sometimes prolongs the disability.

We, as physicians and surgeons, cannot let this factor when present, enter too much into our treatment for it is liable to give us a lack of interest. We should not lose sight of the fact that our mission and obligation is to restore health and we must continue even to fight these extraneous influences as well as the physical causes in the patient. When industry and society in general realize that a sprained back, however minor in nature, may readily become aggravated and the patient in a short time become a total disability if not treated by proper cooperation of all, then and then only, will the majority of these cases be cured.

FINALLY, another phase of this problem is the testimony to be given before a Compensation Referee in case of litigation. After one has had these patients for treatment over a period of weeks or months he comes to the decision that the patient can or cannot work. If he cannot, usually his employer or the insurance carrier wants to know the percentage of disability. Certainly the surgeon who follows his patients over such a prolonged period is better able to testify as to his fitness than one who is called in to examine him once or twice and then gives his opinion. In these cases I find it is hard to testify against the patient, because I often question myself as to whether I am right.

We see so many of these people who say they are disabled because of pain but they present very little objective findings in this belief that they can't go back to work. If you differ, you are asked to tell why and at times it is difficult to justify your opinions. Our tendency is to be with the patient, we believe there are very few who are out and out malingerers, however, at times you will see the patient who should say to himself: "I will get well" but who instead is saying: "I might get well and will have to go back to work."

Certainly it is easier to testify in behalf of the patient whose story is plausible and possible, but I am of the opinion that much testimony is given in behalf of these patients when they do not have true objective findings to substantiate the same.

Discussion:

DR. WILLIS W. LASHER (New York): I suppose the best way to start a discussion is to radically disagree with the speaker, but sometimes this is utterly impossible. In fact, I find myself in complete agreement with practically everything the Doctor has said.

However, I think we should compliment him first of all on the frankness of his paper. He admits that we have difficulty in diagnosis and he has come to the idea, which all of us realize, that we have to make up in our minds certain conclusions which are based in part on impressions.

In this particular connection, I have this impression: When a man comes in decidedly with a chip on his shoulder, and then in a few minutes get very clubby, and then very confidential, and then, finally, he says, "Now, I am not looking for any compensation! I don't want any money! All I want is to get well!" — strangely enough, in my own experience, about nine out of 10 of these cases turn out to be our worst battles.

The second thing in DR. WAGNER's paper is this matter of classification. I think we should highly compliment him on giving us a very practical classification. We have all sorts of classifications, but here is one that is practical; one that can be carefully drawn. There are those which precipitate rapidly and those which develop slowly.

A man comes in who has had an accident — just like that! Fell down in a cold sweat, and so on, there is no question about accident, cause and relation, and those things.

But our trouble has been with those in the second class, those that develop slowly. The patient doesn't know whether it was last week or last month. He can't re-act the accident, and do it over; he doesn't know what happened.

It is very important, as the doctor pointed out, that all the clothing be removed. Then I get in front of the man, and using my index finger so that he understands, I say: "Show me where your back hurts."

If he takes the front of his hand and starts rubbing his back: "It hurts me here, Doctor," and indicates the space from his neck to his buttocks, my first impression is not good.

Perhaps it is general. Perhaps he has an infection. Perhaps the accident was incidental and not truly related to trauma.

DR. WAGNER has emphasized the matter of effusion in the muscles and joints. There can be no question about this. We can see the knee, and we know when we have a severe lesion, invariably we have effusion. We see it in the finger. Unfortunately, we can not see the small bones in the back but, as the doctor concludes, the same pathology exists. Some are obtained by rectal vaginal examination, palpation of the sacro-iliac area, and it was felt there was effusion in the joint.

I, personally, have never gotten a great deal of satisfaction or felt that I got absolute information from any of these examinations. But, in a study of 200 consecutive cases which we made in a single year in order to get a cross section of the backs as they come into our office, there were three or four, strangely enough, who had a definite pitting edema in the lumbar region. So there is no question but that we have an infiltration associated with these things.

As far as the x-rays go, in our series of 200 we had 90% that showed no evidence of trauma. Of course, the older cases had hypertrophic changes, but the little spurs were not broken off. Eight cases of the 200 were fractures of the transverse process, and sometimes I would rather see that than a sprain. Therefore, again, we are

absolutely in accord with the doctor on his 95% x-ray findings.

So far as the injection of sarapin is concerned, we have had no personal experience. I talked only this morning with DR. HARTUNG, of our arthritis department, post-graduate clinic. He has made some 200 injections, and his conclusions are that we do get a palliative relief. But, as the doctor pointed out, these things should be used to keep the patient going; it is not a case of curing him by injection.

In severely injured cases, we must remember the work done by the American College of Surgeons in transportation of these patients. They are picked up many times and put in the back seat of a taxi, all bent over. Can you imagine what might happen to a crushed body jostled around in the back seat of a cab?

Recently around this locality there has been developed a sort of wave, as these things go. A good many men have put these patients in bed and applied traction with the head down in order to get the patient's weight against the traction, and ease the traction on both legs with the idea of sort of pulling them apart.

I have seen these cases treated this way, and I have never felt sure that a great benefit was derived. I think we all appreciate DR. WAGNER'S expression in regard to the attempt to apply traction while the patient is in bed.

We certainly should give DR. WAGNER a halo for denouncing this matter of putting a case in a cast right away. We know we have rapid muscular weakness. I suppose the same might be said to a lesser degree about the use of braces and belts. I have seen cases come in that were injured in the morning, and in the afternoon they had a sacro-iliac belt.

Another thing that should be denounced is this matter of baking. We have seen cases baked continually every day for one year. In fact, it has gone so far that someone asked the chief medical examiner of the State of New York not very long ago, "Doctor, do you spell it with a 'b' or do you spell it with an 'f'?"

DR. WAGNER has brought out a very important thing regarding the psychology. At the last annual meeting of the state medical society, I stated many times it seems as though we place a premium on sickness. The man is taken home; the shades are drawn; flowers are put in the room; and, as the doctor stated, a fellow worker comes in and says, "John, I hurt my back, and I've never been right since."

Then they take him to a hospital. After he has been at home on one of these curved beds that make his back worse, he is put in a nice flat bed in the hospital with pretty nurses, clean linen, flowers, better food than he has had, and things are not so bad.

Then, he goes home and a lawyer see him. Lawyers in certain states have openly said that any man who will consistently say that he sprained his back can obtain $1,000. It sounds good, and he takes the lawyer. Then, he gets a letter from his boss, "Your services are no longer required."

We have two stock prescriptions: one is "Light work;" and the other is "Early settlement." Of course, we have to be very careful in the matter of early settlement in the selection of the case, but there is no reason why we shouldn't have light work.

As the doctor states, we must have the wholehearted cooperation of the employer. Some of the bosses say, "I don't want a man around the factory unless he is 100%. He is going to hurt himself and he is going to hurt someone else." If we can educate the employer to let this man be with his fellow workmen, let him do light jobs, sweep floors, and things like that, we have gone a great step forward.

But, if our two prescriptions fail, then what happens? He stays at home; he gets fat; he gets flabby; his morale is broken; and finally, he gets a fixed idea. Most of us have read the writings of DR. SMART in connection with the extensive work he has done with muscles and tendons. We all recognize the value of muscular exercise. We know a blacksmith has a big arm for the one reason that he uses a hammer.

But, where you can not have voluntary exercise, it would seem to me that stimulating normal muscle contracture would be an ideal condition. Unfortunately, many of us have had little experience with electro-magnetism. The doctor has had a wide experience and it might be well if we had the time for him to tell us briefly a few of the steps in the techniques of his procedure.

As far as manipulation goes, it is successful in some cases but we have to remember there are certain cases where it is not successful. In the insurance world, we have a fine chance to study the end results. We see backs that have been operated on by a variety of surgeons with a variety of techniques in excellent hospitals; and I must say that to date I am still discouraging operations. It is only a last resort, as so many have already pointed out this morning in the various papers.

Finally, the Doctor has taken up the question of testimony. I want to take just a second to tell this story. We had a very tall, powerful man who had been working with a steam shovel. Strangely enough, in our 200 cases, most all of them were short, stocky individuals, but this was a big, tall man.

We paid him for one year, and then I concluded we would stop his payments. So, he was sent to a very eminent orthopedic surgeon with a national reputation. The odd thing about this man was that he would sit on a chair the same as anyone, but with his back on the operating table, you couldn't bend his legs. Obviously, there was something wrong. The surgeon found nothing wrong with him.

He then went to the Labor Department. We have a system in this state of the award of impartial specialists. It is a secret. He is not supposed to know anything about the man. This man was sent to an impartial specialist who put him to bed in the hospital and studied him for one whole week. His conclusion was that there was effusion of the lumbo-sacral joint and also the sacro-iliac.

The referee said that inasmuch as the two eminent specialists disagreed, they must get together and select a third. While this was going on and I cut off his pay, he decided to go into the hold-up business.

He and a group of five other men held up a drug store in Brooklyn, situated near a place where there are a lot of subways coming in so there are a lot of rabbit holes to disappear in. He ran in the subway, followed by two young detectives, and he went in and out of the subways. Finally he was rounded up and sent to the penitentiary for one year.

When he got out, before his hair had grown out, he went to the Labor Department with a pain in his back. We have the proverbial rockpile at our penitentiary. I don't know what he did, but he had a pain. He saw a doctor that had never seen him before. DR. WAGNER made this forceful. He looked at the back and he said, "Partial disability for life."

The end of the case was that a large sum of money was paid to the man in the nature of a lump sum.

The point I would like to make is that where we feel the patient is an outright malingerer, it seems to me if he were vigorously prosecuted and this was widely publicized, not only in medical circles but generally, it might be a blessing to the honest workingman and helpful to the medical profession.

DR. WAGNER (closing): Just in answer to DR. LASHER'S question that something be said about the Morton Smart treatment, that would take a morning in itself, but if you gentlemen are interested, I would advise you to look up his writings.

The essential of the thing is that in these back cases, in any sprain, they must be kept in motion. There is an old Indian adage, "They kept him on the hike." Where there is life, there is motion; where there is no motion, there is no life. Exercise is what these patients need, moving these muscles within their limits and gradually increasing up to normal.

That is what Morton Smart does by his contraction of the muscles in a passive, non-painful way.

The Relation of Effort and Trauma

—*To Acute Coronary Occlusion*—

Arthur M. Master, M.D., Simon Dack, M.D.,
and
Harry L. Jaffe, M.D.

IT IS of the greatest importance to determine whether effort and trauma are causally related to coronary occlusion since coronary artery disease is probably the largest single cause of death in this country.[1] We[2] have estimated that 500,000 to 1,000,000 people sustain a coronary occlusion annually. The importance to industry resides specifically in the fact that coronary disease with occlusion occurs chiefly in patients between the ages of 35 and 60,[3] thus attacking people during the period of their employability. Also it occurs more frequently in males than in females.[3] If coronary occlusion were proved to be precipitated by effort and made compensable the obligation of the employer to labor would be tremendously increased. He would be saddled with the expense of supporting the workman not only during the acute attack but possibly for the rest of his life. Furthermore, industry would be unwilling to employ men who have coronary disease or who have sustained a coronary occlusion. Men with even slight abnormalities of the cardiovascular system would probably be excluded from employment. Thus, a situation would arise in which large numbers of men would be rendered unemployable, even though neither coronary disease nor occlusion is necessarily a contra-indication to working.[4] It is reasonable to assume that a proportion of these unemployables would become public charges.

During the past five years we have investigated the factors associated with the onset of coronary occlusion. Considerable confusion was encountered because, not infrequently, angina pectoris and coronary insufficiency had not been differentiated from coronary occlusion. This is an important distinction which we wish to emphasize. We are concerned in this report with coronary occlusion alone. Although all three conditions are associated with pre-existing coronary artery disease they are in other respects different both clinically and pathologically (Table I). Angina pectoris is essentially a transitory attack of precordial or substernal pain resulting from temporary ischemia of the myocardium produced by effort or excitement. There is no acute anatomic change in the heart muscle and clinically the cardiac findings are unchanged. When the attack is over, the patient's condition is the same as before the attack. The term coronary insufficiency[5] is best restricted to cases of myomalacia without acute occlusion of a coronary artery, although it is employed by some in a general sense to include also angina pectoris and coronary occlusion. It is a field neglected in this country until recently, but it has been treated extensively in the German and Austrian literature.[6] The condition may occur in patients with coronary artery or aortic valvular disease when some factor sets in which diminishes coronary flow or increases the work of the heart. Such factors are heart failure, shock with a drop in blood pressure, acute blood loss, tachycardia. Although an analysis of 50 proved cases of coronary insufficiency with infarction failed to reveal any case which was precipitated by effort or emotion, such a causal relationship is theoretically possible since effort increases the work of the heart. The attack may simulate acute coronary artery occlusion very closely, but it is usually readily differentiated from the latter electrocardiographically, by the presence of RS-T depression in two or more leads and by the absence of Q waves and RS-T elevation.[5,6] The alterations in the electrocardiogram are of shorter duration than in coronary occlusion, disappearing usually within one or two weeks.

Coronary occlusion, with which we are concerned in this paper, usually follows a very definite clinical and pathological pattern. The attack is characterized, as a rule, by severe substernal pain, nausea or vomiting, changes in the heart sounds, signs of left heart failure, a drop in blood pressure, fever, leucocytosis, rapid sedimentation rate, and a progressive electrocardiographic pattern with elevation of the RS-T segment and Q-waves.

Effort in Coronary Occlusion

WE HAVE already presented data concerning the relation of effort to coronary occlusion in several previous papers[7] which have included a discussion of the literature. This report brings our findings up to the present, and comprises 1620 attacks of coronary occlusion, the largest series ever investigated.

In eliciting the facts concerning the onset of coronary occlusion we have employed a questionnaire which takes up in detail the activities of the patient, not only at the time of the attack but during the preceding 24 hours and including the four weeks prior to the attack. The patient was interviewed soon after admission to the hospital unless his condition did not permit, in which case the family was questioned. We have omitted 50 cases seeking compensation since we have found that the histories given by these are frequently unreliable. A comparison of the history given by the patient in the hospital soon after the attack and that given at the compensation hearing months later reveals that the former story is often entirely at variance with the latter.

Our findings concerning the activities associated with the onset of coronary occlusion are tabulated in Table 2. It will be seen that 52.5% of the attacks occurred during sleep or rest, 21% during mild routine activity, 15.5% while walking at an ordinary pace and 9% during moderate activity. Only 2% were associated with unusual activity. If we consider these percentages in relation to the

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portion of the day spent in each of the activities mentioned, we find that they correspond quite closely. For example, the majority of people spend at least 40 to 50% of the day at rest and asleep. Therefore, it was to be expected, as we found, that at least 40 to 50% of the attacks occurred during these states and it may reasonably be concluded that the onset was not influenced by the activity or lack of activity of the patient at the time. Although the greatest number of attacks took place during rest or sleep we do not believe that these influenced the onset of the attack. More time was spent in these states than in any other and the association was, therefore, merely incidental.

Several authors have stated that effort may precipitate coronary occlusion.[8,9] However, the fact that unusual activity was associated with the attack in only 2% of our cases rules out effort as a factor. Certainly all of us, including those with heart disease, engage in some unusual effort daily and if this were a factor it would be associated more frequently with coronary occlusion. The number of attacks of coronary occlusion would therefore be much greater than at present, since coronary artery disease is very common.

Several additional findings confirm our conclusion that effort is not a factor in the onset of coronary occlusion. Thus 70 of our cases had been bedridden for weeks or months prior to the occlusion because of a chronic illness. Surely there was no question of effort in these cases. Also, in tabulating the occupations of the patients in our series (Table 3a), it was found that all types were represented. Persons leading sedentary lives were as common as heavy laborers. Thirty-six

TABLE 1

DIFFERENTIATION OF ANGINA PECTORIS, CORONARY INSUFFICIENCY, AND CORONARY OCCLUSION

	Angina Pectoris	Infarction Without Occlusion (Coronary Insufficiency)	Infarction Following Coronary Occlusion
Predisposing Factors	Coronary sclerosis Hypertension	Coronary sclersois Large heart Hypertension Aortic stenosis	Coronary sclerosis Hypertension
Exciting Cause at Onset	Exertion Excitement Eating Cold Insulin, adrenalin Tobacco Trauma?	Exertion Excitement? Tachycardia Shock Hemorrhage Heart Failure Operation Infection Trauma?	None
Duration of Pain	Transitory	Variable—not infrequently absent	Prolonged
Effect of Nitroglycerine	Relieved	Not relieved	Unaffected or intensified
Shock	Absent	Present	Present
Nausea and Vomiting	Absent	Uncommon	Common
Cardiac findings Heart sounds Heart failure Rhythm	 Unchanged Absent R. S. R.	 Poor, gallop Present Arrhythmias occasionally	 Poor, gallop Present Arrhythmias common
Blood pressure	Unchanged or rises	Falls	Falls
E. C. G.	Unchanged Transitory RS-T depressions	RS-T depressions	Definite pattern RS-T elevation Q-waves Reciprocal relation of leads 1 and 3
Lungs	Unchanged	Congestion Left heart failure	Congestion Left heart failure
Laboratory findings	Normal	Fever Leukocytosis Sed. rate rapid Azotemia Glycosuria	Fever Leukocytosis Sed. rate rapid Azotemia Glycosuria
Condition after attach	Normal	Variable Recovery rapid or slow	Prolonged illness
Physiology	Temporary ischemia Decreased coronary flow Increased work of heart	Prolonged ischemia Decreased coronary flow Increased work of heart	Prolonged ischemia Complete blocking of coronary flow
Pathology	No acute changes	Infarction Focal Disseminated Subendocardial Often microscopic Pericarditis	Infarction Confluent Massive Thru and thru Pericarditis common Mural thrombosis and embolism

per cent were manual workers and laborers, 9.5% white collar and office workers, 8.5% professional persons, 11% business men, 20% housewives and 9.5% were retired. These percentages parallel the occupational distribution of the general population in New York City (Table 3b).[10] Thus, occupation, whether strenuous or not, did not play a role in coronary occlusion.

The authors who associated effort with coronary occlusion assume that effort, by raising the blood pressure, ruptures the intimal capillaries and produces hemorrhage into an atherosclerotic plaque, which has been shown to initiate thrombus formation.[8] However, it is well known that an increase in arterial pressure is not transmitted to the peripheral capillaries. Similarly, there is no proof at all that an increase in aortic blood pressure is transmitted to the capillaries arising from the lumen or adventitia of the coronary arteries. As a matter of fact, Winternitz and his co-workers[11] injected the coronary arteries in human hearts with coronary disease at a pressure of 500 to 1000 mm. Hg, without rupturing the intimal capillaries. These enormous pressures are far beyond any attained during life. Furthermore, careful histological examination in a large series of cases of coronary occlusion[12] revealed that intimal hemorrhage due to capillary rupture was not more frequent in cases with preceding hypertension than in non-hypertensive cases. Also, in the cases already mentioned who had been bedridden prior to the attack, intimal hemorrhage in those who died was as common as in patients who had been active. All the evidence at present thus points to the fact that intimal hemorrhage is an end result of arteriosclerosis and occurs independently of external factors, including a rise in blood pressure.

Some of those who believe that effort may precipitate occlusion of a coronary artery base their opinion on the observation of an occasional case in which the attack seemed to be associated with activity. Yet, even these authors[9] admit that most cases occur at rest or during sleep and in the cases cited the relation between the effort and the occlusion seems to be entirely coincidental.

TABLE 2a

TYPES OF ACTIVITY AT ONSET OF CORONARY OCCLUSION

(1620 attacks)

A. Actual Activities	No.	Pct.
1. Sleep	231	22.5%
2. Rest—lying or sitting down	307	30.0%
3. Ordinary mild activity	213	21.0%
4. Moderate activity (except walking)	92	9.0%
5. Walking	160	15.5%
6. Unusual or severe exertion	20	2.0%
7. Undetermined	40	
Total	1063	

TABLE 2b

ASSOCIATED ACTIVITIES AT ONSET OF CORONARY ARTERY OCCLUSION

(1620 attacks)

B. Associated Factors	No.	Pct.
1. Meals	100	9.0%
2. Excitement	61	5.5%
3. Surgical Procedures	63	5.5%
4. Infection	45	4.0%
5. Miscellaneous	13	1.0%
Total	282	

Trauma and Coronary Occlusion

LIKE effort, trauma has been reputed to precipitate coronary occlusion. In our series trauma was present in only one case and was probably coincidental. The patient entered the hospital following an eye injury. He was apparently well and in bed several days when he suffered a coronary occlusion. Two other cases who sought compensation are not included, but even in these there was no direct relation to the trauma, which was mild. In one case the injury was a fall on the knee from a ladder, in the other the chest was bruised.

TABLE 3a

OCCUPATIONS IN 1215 CASES OF CORONARY OCCLUSION

	No.	Pct.
1. Workers and laborers	438	36.0%
2. Store workers	67	5.5%
3. White collar and office workers	115	9.5%
4. Business men	133	11.0%
5. Professional class	104	8.5%
6. Housewives	240	20.0%
7. None or retired	118	9.5%
Total	1215	

TABLE 3b

COMPARISON OF OCCUPATIONS IN CORONARY OCCLUSION AND GENERAL POPULATION

	Coronary Occlusion	U. S. Census N. Y. C. 1930
All occupations	857	3,187,459
Workers and laborers	51%	55%
Store, office, business men	37%	37%
Professional workers	12%	8%

An extensive literature[13] has accumulated, consisting chiefly of case reports, purporting to show a direct relation between trauma, especially of the chest, and changes in the heart. The latter have been grouped into commotio cordis, contusion of the heart, coronary insufficiency with myomalacia and coronary thrombosis with infarction. Commotio cordis is a functional derangement without obvious anatomic alterations; it is evidenced by arrhythmias, including heart block, a drop in blood pressure, a rise in venous pressure, and changes in the electrocardiogram similar to those seen in coronary insufficiency. In contusion of the heart there are gross changes in the myocardium and the clinical picture may simulate coronary occlusion with infarction, heart failure or angina pectoris. Any type of injury to the chest or abdomen may produce traumatic changes in the heart. The injury need not penetrate the chest in order to damage the heart; thus steering wheel accidents not uncommonly cause contusion or rupture of the heart followed by death.

Because of our specific concern with coronary occlusion we have made a critical review of the literature reporting individual cases in which the

attack is said to have been caused by trauma, and we have been forced to the inevitable conclusion that there is a serious lack of definite proof of any relationship between the two. A causal connection is repeatedly attributed to trauma when the latter is obviously merely coincidental.[9,13,14,15] Unwarranted assumptions are made and frequently the reasoning is illogical. Furthermore, a number of authors not only uncritically accept the conclusions of previous reporters of individual cases but also cite them so that they perpetuate the concept as if it were actually proved. At first glance one seems to be confronted with many cases, but actually they are the same cases which are referred to again and again.

The majority of cases in which trauma is supposed to have produced coronary occlusion are actually instances of contusion of the heart without coronary occlusion. Either the pathological findings are described as areas of myomalacia or infarction, which usually are presumed without evidence to result from coronary occlusion, or the condition of the coronary arteries is not specified at all. The chief offender is Warburg[13] who collected from the literature cases of trauma to the heart and added several of his own. In regard to coronary occlusion he cites a case which had been previously reported[16] of a young man who sustained a chest injury at the age of 12 and died at 25. At necropsy an aneurysm of the left ventricle was found and it was remarked that the descending branch of the left coronary artery had probably been destroyed by the trauma 13 years prior to death. There is no indication of coronary thrombosis and it is much more logical to assume that the trauma had produced a large contusion of the heart. Yet this case has recently been cited again as one of traumatic coronary occlusion by one author[9] who also refers to three cases described by Bean.[17] Yet in none of these was mention made of the coronary arteries, although the infarction or myocardial scarring is assumed to be secondary to occlusion. Furthermore, the injury sustained in one case was fracture of the skull, which can be linked to myocardial infarction only by a stretch of the imagination. Dietrich[18] also cites several cases which showed only myomalacia without acute changes in the coronary arteries, yet Schlomka[19] refers to these cases among the few indicating coronary occlusion resulting from trauma.

Another group of cases in which coronary occlusion was attributed to trauma includes many instances in which the trauma obviously or probably was coincidental, since coronary sclerosis of long standing was found at necropsy and an anginal syndrome had been present prior to the accident. For example, Schmincke[20] reports the case of a man of 45 whose precordium was injured by a wagon shaft and who died of heart failure six months later. His death was accounted for by the presence of fresh thrombosis in the left coronary artery. In addition, there were organized thrombi and an aneurysm of the left ventricle, which the author concluded had been produced by the trauma. However, it is more likely that the old, as well as the fresh thrombi were formed on the basis of arteriosclerosis in the coronary arteries, apart from the trauma. Yet Warburg[13] and Boas[9] present this case as a definite example of coronary thrombosis due to trauma. Another case reported by Warburg is that of a policeman 44 years old who died 15 days after an injury. In spite of the fact that the patient had apparently had an anginal syndrome for one year prior to the accident, Warburg states that there is no doubt that the occlusion was a direct consequence of the injury. It seems to us just as reasonable to regard it as an end result of the coronary artery disease. Two more cases of reputed coronary thrombosis caused by trauma are presented by Spicer.[15] The first was a woman of 63 who complained of vague pains in the chest not typical of coronary disease after an injury to the left lower ribs. Examination was negative 15 months later but she died soon thereafter of coronary thrombosis. In spite of the long interval between the injury and death, and the absence of a characteristic anginal syndrome, the injury is assumed to have produced the coronary thrombosis. Furthermore, the latter was a clinical diagnosis only, a necropsy not having been performed. Nevertheless, such faulty reasoning characterized most of the work done in this field. The second case was a man of 58 who was known to have had lues, hypertension and angina pectoris due to coronary disease for several years. In an automobile mishap the manubrium sterni was fractured. Eight hours later he was seized with substernal pain and dyspnea and died. Postmortem examination revealed coronary sclerosis with a recent thrombus in the right coronary artery. In the face of long-standing coronary artery disease it does not seem reasonable to attribute the thrombosis to the trauma.

Three cases remain in which the data do not permit a definite conclusion. One was a boy of 18 years of age who was hit by a football in the abdomen and died soon thereafter.[21] At necropsy the heart was incompletely ruptured, the result of myomalacia. Apart from this there was a tiny sclerotic plaque with intimal hemorrhage and an overlying incompletely occluding thrombus in the left anterior descending artery. It is likely that the trauma produced the myomalacia, but its relation to the hemorrhage in the plaque is not clear. Kienle[22] describes the case of a 40 year old man who fell on his back while skiing. Shortly thereafter he collapsed and ran the clinical course of coronary occlusion, with typical electrocardiographic changes, although this was not proved, since the patient survived. It is possible that the occlusion in this case had formed prior to the fall and, indeed, may have been the cause of the fall. Another case[23] is that of a man of 57 who was struck over the precordium by a golf ball and collapsed. Three days later the electrocardiogram is said to have shown evidence of cardiac infarction. It is not unlikely that this was an instance of coronary insufficiency or contusion of the heart

and not coronary occlusion. This differentiation might have been confirmed by the electrocardiogram which unfortunately is not shown.

It is apparent, from our survey, that like effort, trauma is very rarely associated with coronary occlusion, if at all. It is noteworthy that, although Boas[9] thinks trauma may cause coronary thrombosis in occasional cases, he admits that the "preponderant opinion at present seems to be that trauma and effort so rarely precede the onset of coronary thrombosis that their association is just coincidental." Since injuries are common, it appears to us that if they were a causative factor in coronary occlusion, the two should frequently occur together. While the citation of a few cases of coronary occlusion which superficially at least seem to be related to trauma might impress one, a much stronger case against trauma as a cause of occlusion can be built up by recounting the thousands of cases of coronary occlusion entirely unrelated to trauma. The evolution of coronary occlusion from coronary artery disease is a very definite pathological pattern which is not related to any external event. There is no proof that trauma can cause coronary occlusion with infarction.

Summary

THE subject of the relation of effort and trauma to the onset of coronary occlusion is of great importance to industry. This disease affects workers of all types, and the question of compensation often arises.

2. The activities associated with the onset of coronary occlusion were investigated in 1620 attacks. Angina pectoris and coronary insufficiency with infarction, which must be differentiated from coronary occlusion, were excluded.

3. The percentage of attacks which occurred during sleep, rest, mild or moderate activity coincided with the proportion of the day usually spent in these states. The occurrence of coronary occlusion thus seemed to be coincidental.

4. Only 2% of attacks were apparently associated with severe exertion. From this and other facts which were discussed it was proved that effort was not a factor in coronary occlusion.

5. Coronary occlusion occurred with equal frequency in all types of occupations and all classes of society.

6. Trauma was doubtfully associated with coronary occlusion in only one case of our series; this trifling incidence excludes trauma as a cause of coronary occlusion.

7. A detailed review of the literature reveals that cases of coronary occlusion attributed to trauma are actually instances of cardiac contusion. When coronary occlusion was proven, the trauma seemed to be coincidental.

8. Coronary occlusion is the end result of the sclerotic process and occurs independently of external influences.

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Discussion:

DR. ROBERT L. LEVY: DR. MASTER has presented an imposing array of figures and an interesting analysis.

I shall not discuss trauma because my experience with it, apparently like his, is very small.

There do appear to be cases in the literature in which some external violence was followed by an injury to a coronary branch, and that this might be so, I think one would have to admit.

But in the case of exertion my experience is more personal and is not, perhaps, exactly like that of DR. MASTER'S. He has assumed, as you heard, that because the incidence of the association of effort with the onset of occlusion is small; therefore, effort, exertion, as the cause of coronary occlusion may be dismissed.

Well, now, rupture of the heart following infarction is a comparatively rare complication, but nobody would go so far as to say that because it occurred infrequently it didn't occur at all. It seems to me that same line of reasoning may be applied in the case of infarction due to occlusion.

I think one must assume, as DR. MASTER has indicated, that as a basis one must have pre-existing disease in the coronary artery, but the relationship between an unusual effort and the onset of this syndrome is often very striking.

I shall not give long histories, but in the past year there was the case of a trained nurse who had been taking care of an old lady for whom I was responsible, had been with her for several years. She was perfectly well, a woman of 43. Her only vice, so far as I know, was that she was overly fond of cigarettes and was always seeking an occasion to slip away and have one.

One afternoon she started to move some furniture. As she was lifting a heavy armchair, she suddenly dropped it and complained of this agonizing pain in her substernal area. For some seven months she lingered between life and death, and finally died of cardiac failure.

Her heart at autopsy—mind you, she was only 43—was very little enlarged, weighed 340 grams. But her coronary arteries showed everywhere extensive arteriosclerosis. There was a large area of infarction in the left ventricle with an enormous clot, and the aorta showed changes.

The second case was that of a western physician, whose name, I am sure, was well known to most of you. He came here about a year and a half ago with a patient who was to be operated on in one of our New York hospitals. He had the room next door to that patient. He came in one night after dinner to find that the window was stuck.

He was 67 years of age; had been perfectly well; and was in the habit of playing tennis and had done so up to the time of his visit to New York. He struggled with this window, and, he said himself, he got pretty much irritated at the idea that it wouldn't yield to his efforts.

Immediately—there was no delay—he had his pain with the typical anterior infarction which confined him to the hospital long after his patient had been discharged.

There was a third instance of a man who had had some twinges before and whose attack occurred after rolling his tennis court with a two-man roller, as he put it.

In short, then, although the number of attacks occurring in the absence of exertion certainly is far greater than the number which follows effort, yet it seems to me that one can not, because of this small incidence, completely rule out that factor as a precipitating cause.

Each case, when it comes to medicolegal considerations, it seems to me, must be judged on its own merits. But, the possibility that effort or trauma may play a role can not be, it seems to me, entirely dismissed.

DR. MASTER (closing): I was very much interested in DR. LEVY'S remarks. Of course, this subject lends itself very well to debate and controversy.

It is to be remembered that fully half the cases of coronary occlusion have premonitory preliminary pain. It is assumed that the occlusion or thrombosis takes hours and days, and some authors even believe weeks, in forming. So, it is perfectly conceivable and, as a matter of fact, I believe firmly that in this premonitory phase or preliminary phase, effort or exertion will bring on pain as it will in an ordinary episode of angina pectoris. In other words, while the artery is getting narrower and narrower, pain will be brought on by any exertion.

In regard to the occasional case, that is a very common argument; namely, that even if you agree that the vast majority of attacks of coronary occlusion occur irrespective of effort, how can you rule out that this particular effort in this particular case did cause the coronary occlusion?

We have given a good many arguments. The 2% incidence, as a matter of fact, I think is the least influential of our arguments. Half a million to a million attacks of coronary occlusion occur in this country of 130 million people. So, it is conceivable that occasionally there will be a coincidence between an unusual effort—moving furniture or lifting a stuck window—and the coronary occlusion.

I enumerated the fact that we had 70 patients who had been in bed for weeks and months before they developed coronary occlusion.

About the furniture and the window, why not turn it around? As I said, there are probably 20 million people in this country over 50 with coronary disease. They move furniture every day and open stuck windows. In my little country place in Harrison, it seems to me all I do is lift windows. Probably for that one story of the lady who was moving furniture, you could pick up a half a million or 10 thousand stories where there was no relationship between moving furniture in people over 50 and coronary occlusion.

In other words, if there was a relationship between effort and trauma and coronary occlusion, it ought to be as frequent as the relationship between effort and trauma and angina pectoris. You know in every instance of angina pectoris you will find every effort will produce angina pectoris, and certainly every effort does not produce coronary occlusion.

Southern Railway Surgeons

—Forty-Third Annual Meeting—

THE ASSOCIATION OF SURGEONS OF THE SOUTHERN RAILWAY SYSTEM held its Forty-Third Annual Meeting at Hotel Fort Sumter, Charleston, South Carolina, on June 4, 5, 6, 1940.

After the call to order by DR. W. H. FRAMPTON, of Charleston, Chairman of the Arrangements Committee, and the invocation of DR. WILLIAM WAY, the welcome of the City of Charleston was extended by MR. J. ALBERT VON DOHLEN, of the City Council, on behalf of the Mayor. In his response for the Association, DR. W. S. NASH, of Knoxville, Tennessee, recalled that the Association had last met in Charleston in 1924.

Tuesday, June 4, 1940

DR. F. WEBB GRIFFITH, of Asheville, North Carolina, President of the Association, then opened the Tuesday morning session with the following remarks:

"How fortunate we are to be able to meet in such a charming and peaceful city and carry on our discussions without the paralyzing fear that some casual remark might bring swift punishment. May we preserve that privilege at any cost.

"The immediate future looks dark and no one can predict with any degree of certainty what may happen even in the next few months. The Southern Railway System may become a still more im-

portant and vital organ in the life of this country. In case of a crisis or national peril, I feel confident that every member of this Association stands ready, regardless of compensation, to give the best that is in him out of loyalty to the Southern Railroad and as a patriotic duty. 'He profits most who serves best.' 'One man was making $1.50 a day, another was hewing stone, the third was helping to build a cathedral.' We as surgeons of the Southern Railway, are not merely working for the fees allowed, or for the privilege of free transporation, we are helping to maintain a great railway system of which we are justly proud.

"The medical profession stands indicted before the highest court in this country. The Department of Justice considers us no longer a learned profession, but merely tradesmen, violating the law by restraint of trade. Nothing could be further from the truth. The minimum wage, the limitation of working hours, the right to strike, collective bargaining and other things usually associated with the trades units have no place in medicine. Our high ideals and standards of ethics antedate Christianity. Our profession composed of men of all races, nationalities, creeds and color can show a record of unselfish and humane service unequalled by any other profession or group of men.

"Our country faces the greatest danger in its history. Let us forget that we are Democrats or Republicans, Conservatives or New Dealers, remembering only that we are loyal citizens, members of a great profession, eager to serve, and, if need be, to defend, our country."

The Association then heard a short address by MR. S. R. PRINCE, General Counsel for the Southern Railway. MR. PRINCE closed with the expression that surgical matters on the Southern were never better handled, and the surgical departments never better headed.

As Presiding officer, DR. GRIFFITH then asked for the reports of the standing committees. These were given as follows: Arrangements, by DR. W. H. FRAMPTON; New Members, by DR. GILES M. FLEMING, Cleveland, North Carolina; and Necrology, by DR. WM. A. BOYD, Columbia, South Carolina. Then came the report of the Secretary-Treasurer, MISS EDITH A. FOLTZ, of Washington, D. C. The report of the Executive Committee was deferred to Wednesday's closing session. DR. W. W. HARPER, of Selma, Alabama, Recording Secretary, read the minutes of the previous meeting, at Washington, D. C., in 1939. DR. S. R. MILLER, of Knoxville, Tennessee, reported on certain proposed amendments of the Constitution and By-Laws; DR. W. S. AUSTIN, spoke on the matter of membership dues; and telegrams were sent to DRS. W. W. CUNNINGHAM and THOS. H. HANCOCK, charter members, who were unable to be present on account of illness.

DR. S. R. MILLER, of Knoxville, Tennessee, then presented his paper on "Practical Points in the Diagnosis and Treatment of Fractures of the Upper Fourth of the Humerus." The important points in such diagnosis and treatment are: (1) Careful physical examination of the normal shoulder should be made for comparison. (2) Systematic examination of the injured shoulder should be made. (3) One must be sure the head of the humerus is not dislocated; if physical examination does not reveal a dislocation, careful stereoscopic x-ray should be made. (4) If the greater tubercle is displaced upwards, it must be reduced; if it cannot be reduced downwards, the shaft must be abducted and brought up to the displaced tubercle. (5) Fracture of the lesser tubercle and epiphyseal separation after reduction needs little after-treatment. (6) Epiphyseal separation occurs between six and 20 years. (7) Fracture of the anatomical neck rarily or never occurs, except in the aged. (8) Often an incomplete reduction will secure good functional result if the greater tubercle is not left near the acromial process, for the reason that the entire shoulder is capable of great movement.

This paper was discussed by DR. E. DUNBAR NEWELL, of Chattanooga, Tennessee, DR. B. E. BOYER, of Cincinnati, Ohio, DR. W. S. NASH, of Knoxville, and DR. W. W. HARPER, of Selma, Alabama.

THE Tuesday afternoon session opened with the address of MR. E. P. OLIVER, Vice-President of the Southern Railway, who talked of the place of the South in the economic life of the nation, and, with figures and statistics, developed the thesis that the South should be no longer considered the country's No. 1 economic problem, but instead should be viewed, in the light of its natural wealth and resources, as the country's No. 1 economic opportunity.

DR. J. PAUL KENT of Alta Vista, Virginia, then read his paper on "A Simple Method for Treatment of Acute Suppurative Arthritis." This described the results of "the use of a simple method in the home, namely aspiration and air insufflation," in three cases. The full text of the paper appears on pages 368-370, herein.

DRS. E. DUNBAR NEWELL, W. W. HARPER, and EDWARD T. NEWELL participated in the discussion.

IN THE absence of DR. WILLIAM H. SMITH, of Goldsboro, North Carolina, who was to have talked on "The Manifestations of Diabetes," DR. ROSCOE D. MCMILLAN, Red Springs, North Carolina, spoke on "Emergency Treatment of Acute Heart Failure in General Practice." He stressed the fact that emergency treatment must be quick, but that even so it is advisable to get as much of the history as possible. Well-chosen questions—circumstances of onset, hour, etc. — may prove very valuable and these items of information, together with all possible data from examination quickly made, are exceedingly helpful in fixing the treatment. Acute heart conditions are often associated with acute infectious diseases, infections, rheumatic afflictions, arhythmias, and pulmonary embolism. The most important therapy

is in avoidance — prevention — in infectious diseases. Some conditions simulate acute heart failure—pulmonary embolism, spontaneous pneumothorax, atelectasis, and pleural effusion. Among the general symptoms are breathlessness and palpitation.

DR. NEAL KITCHENS, of Warm Springs, Georgia, gave an interesting talk on his experiences with orange juice as a means of obtaining renewed energy and keeping awake while driving. Discovering its effectiveness in his own case by chance, he conducted 150 experiments on 150 different people, and, of these, 149 found it as valuable and effective as did DR. KITCHEN himself. One of his experimenters, a young woman, drove 16 hours a day on two successive days, and "never missed an orange stand." DR. KITCHENS found canned orange juice about 80% as effective as that from the fresh fruit. He reported that fresh orange juice analyzes as containing the same proportions of potassium, sodium, manganese, calcium, chloride, and iron as brain tissue. He recommends that oranges, or canned orange juice in 6 oz. cans, be standard equipment for a long drive.

DR. W. W. HARPER, of Selma, Alabama, spoke on "The Present View of Shock." He said:

"While attending the Philadelphia Post-graduate institute last month I listened to a wonderful symposium on shock, led by Dr. Norman Freeman. The ideas expressed were so new to me that I thought you might enjoy a resumé of what I heard.

"In shock there is a marked slowing down of the blood flow in the arterial capillaries, which produces an oxygen starvation of the tissues. This anoxemia causes cell death with the formation of toxins that act harmfully on the intima of the capillaries, changing an osnanburg capillary to one of a cheese cloth porosity. As a result the blood plasma leaks out into the tissues, leaving the red cells stranded in the capillaries. The cells are thus further damaged by this plasma flood. The arterioles are in a state of contraction with a dilatation of the venous capillaries. There is no dilatation of the large abdominal venous system.

"As a result of the vasomotor contraction of the arterioles the skin is pale and cold with a tendency to sweating.

"The causes of shock are — hemorrhage, pain, fear, cold. The last three causes can and do operate independently of hemorrhage. There is nothing wrong with the heart; therefore stimulants are not only not needed but are harmful; especially is this true of adrenalin, which increases the shock by further increasing vasomotor constriction.

"In the treatment of shock: (1) stop all hemorrhages. (2) Transfuse, from 200 to 500 cc. of blood, where blood is available. It is not necessary to group blood but blood should be matched. This is done by putting a few drops of the patient's serum on a drop of the donor's cells; if the blood matches the cells should stand out individually; if it does not match there will be agglutination or clumping of the cells together. In many places they are using banked blood. This, however, is not necessary, since we know that the cause of the shock is the loss of blood volume or plasma. Some drug houses are now stocking blood plasma. This can be used without typing or matching; simply take the plasma and inject. It is questionable whether injection of normal salt solution or glucose solution will do any good. If the glucose solution is used it should be a 5% solution, as stronger solutions seem to irritate the intima of the capillaries.

"Morphine should be given in sufficient doses to relieve pain and quiet the patient. The patient should be kept in a dark room, free from the attentions of relatives, friends, over-zealous nurses and doctors. The room should be kept dark; body temperature should be maintained with heat and blankets.

"In crushing injuries of the extremities it is best to wait until the patient reacts from the shock before amputating. Where the shock is not due to hemorrhage the treatment consists in giving large doses of morphine, a dark room, body heat maintained with blankets and hot water bottles. If this technique is carried out in the early stages of shock the vast majority of patients will recover. When the treatment of shock is delayed until tissue changes take place the patient will die it matters not what form of treatment is carried out. Blood transfusions will do no good."

Wednesday, June 5, 1940

DR. J. MARSH FRERE, of Chattanooga, Tennesssee, presented "The Role of X-Ray in the Diagnosis and Treatment of Fractured Hips," with moving pictures and slides. He showed and described a large number of cases of successful fixation of hip fractures, in practically all of which the x-ray furnished the assurance of successful technique.

The discussion of this presentation was opened by DR. RALPH G. CAROTHERS, Chief Surgeon, C.N.O. & T.P. Ry., Cincinnati, Ohio. He gave full credit to the x-ray men for the perfection of the lateral view which is so essential in this form of fixation, showing slides of his own methods of taking laterals to guide the insertion of pins, and explaining the form and technique of the type of pin he has developed for his own use. He advocated getting the patient on his feet as soon as possible after proper fixation; emphasized the importance of parallel insertion of the pins along the natural lines of stress; showed pictures of a woman who walked on the same day her fractured hip was fixed in place by his method; and concluded with the statistics of 85% successful results in his large number of cases—the 15% being accounted for in the cases of earlier years when methods were less skilled and equipment more crude. DR. E. DUNBAR NEWELL expressed his view that, in these days of

x-ray and modern technique, it is unfair to the patient with a fractured hip not to give him the advantages of internal fixation; pinning as against the cast is the difference between a few weeks and a few, or more, months. DR. HUGH S. BLACK, of Spartanburg, South Carolina, confirmed the advantages of pinning, although he sometimes falls back on the immobilization by cast. DR. FRERE, in closing the discussion, said that in none of the many cases of his own experience has it been necessary to remove the pins, even though in some instances, the x-rays of a year or so after fixation show that they protrude to a slight extent.

DR. HUGH S. BLACK read his paper "Some Remarks on Hospitals and Clinics Gleaned from a Recent Trip to South America."

DR. EDWARD T. NEWELL presented a very interesting moving picture of "The Orr Treatment of Chronic Osteomyelitis." His remarks embraced the contrast between the methods of 25 years ago and today; touched upon the successive developments — the Dakin tube, the maggot treatment, and finally DR. ORR's operation; and stated that his results with the latter have been in excess of 90% under proper application. With reference to the picture, he stressed the importance of spreading the tissues wide apart, getting rid of all diseased tissue, and packing widely and openly to compel healing from the bottom. In the case shown the dressings were changed in about three weeks, and the patient was dismissed in 12 weeks, after four re-dressings. DR. NEWELL now uses the Orr treatment routinely. DR. S. R. MILLER, of Knoxville, DR. C. O. BATES, of Greenville, South Carolina, DR. W. W. REYNOLDS, of Meriden, Mississippi, DR. B. E. BOYER, of Cincinnati, and DR. W. W. HARPER, of Selma, Alabama, participated in the discussion.

DR. RALPH G. CAROTHERS, Chief Surgeon, C.N.O. & T.P. Ry., Cincinnati, gave an interesting and valuable presentation on "Classification of Ankle Fractures." It is sometimes thought that any fracture below the knee is a Pott's fracture. The books classify fractures mainly according to the type of accident that causes them; an ankle fracture occurring from the same force and in the same circumstances as a lower leg fracture is, therefore, classed as a lower leg fracture. Ankle fractures have their own classification. (Here the essayist showed slides of the different kinds of ankle fractures, common and uncommon, and, to differentiate, a typical Pott's fracture.) The Pott's fracture is ordinarily easy to hold; ankle fractures are usually difficult to hold. Careful study of ankle fractures is necessary, in order that the full extent of the involvement may not be overlooked. The more or less often-heard statement that a sprain is worse than a break is sometimes apparently true because the break is not found, while the attention is centered on the sprain. In brief, not all ankle fractures are Pott's fractures; and when they are different in fact they must be handled differently in treatment. Careful diagnosis is absolutely necessary.

In the discussion, DR. EDWARD T. NEWELL noted that 15 years ago there were many more Pott's fractures in proportion to the total of fractures seen, but that now there are more multiple fractures. DR. CAROTHERS, closing the discussion, pointed out that treatment of ankle fractures usually has no need of internal fixation.

DR. GLENN I. JONES, Chief Surgeon, Southern Railway, Washington, D. C., conducted a round table discussion involving problems under three headings: (1) Delayed recoveries in cases of traumatic injury, the delays being due to focal infections developing after the injury. Thus the examination should include teeth, tonsils and prostate, so that if there is tardiness in the progress of recovery appropriate action can be taken. (2) Fractures and dislocations suggesting consultation should be freely referred to the company's orthopedic consultant. (3) The forms to be studied and reviewed by the medical men of the Railroad Retirement Board should be filled out with meticulous attention to detail, and, wherever the examining physician reports a condition, the supporting data should be carefully and fully set forth. All questions on this form should be answered. As a general subject, the importance of complete examinations on even slight injury was discussed at some length.

DR. HARRY WINKLER, of Charlotte, North Carolina, read his paper on "Derangements of the Low Back with Sciatica." He outlined the anatomy of the low back area, the pathology, the symptomology, the diagnosis and the treatment. The increasing incidence of low back derangement with sciatica may be due to poorer muscular development in more people failing to compensate for weakness in the anomalous spinal column. Some cases may be due to nutritional deficiency, or to infections, or to postural defect. Many of these respond to more or less simple treatment; others require hospitalization and longer and more radical treatment. The displaced or hermated intervertebral disc must be ruled out in a certain number of cases of sciatic pain, but the incidence of displacement is comparatively low. Sectioning of the ilio-tibial band, together with manipulation of the involved leg where the Ober and other signs indicate definite contracture of the fascia lata will give a high percentage of cures in derangements of the low back with sciatic pain.

The discussion of DR. WINKLER's presentation brought comments from DR. W. A. BOYD, and DR. J. MARSH FRERE, after which DR. BOYD introduced DR. F. A. HOSHALL, of Charleston. DR. HOSHALL conducted a dry clinic, showing three cases: (1) An army man who had gone unhurt through the first World War and the years since, only to fall from a ladder in his home and sustain a fracture of the first lumbar vertebra. (2) A man who had

fallen 50 feet and crushed his 10th thoracic vertebra. And (3) a negro whose injury to his 3rd lumbar vertebra had resulted in complete paralysis of his lower right side and partial paralysis of his lower left side. The interesting anomaly of an extended spinal cord, found in this case, was commented upon at some length. All three patients had restoration of function in all respects of complete recovery. The discussion brought comments from DR. EDWARD T. NEWELL, DR. W. C. BOYD, DR. E. DUNBAR NEWELL, and DR. HARRY WINKLER.

DR. NEWTON P. CLARK, of Spartanburg, South Carolina, gave the last paper, "Serious Conditions of the Eye and Ear Following Minor Ailments." Not only are the eyes subject to injury from without, but they also may become diseased from conditions within, some as remote as certain fields of allergy that may lead to loss of vision when minor things are neglected. A neglected cinder thus may lead to corneal abscess—although the essayist in his practice had never seen trouble follow the removal of a foreign body within 48 hours unless there was a neighboring disease of the tonsils and sinuses. Old and underlying luetic conditions are important, as potentially destructive of eye function. In eye examinations no possibility of near or remote contributing conditions should be overlooked. This includes causes inherent in local or constitutional allergic predispositions, and extends even to such matters as sleeping quarters, food, clothing, and atmospheric conditions. (The essayist related an experience where 60 school children were suffering from blepharitis caused by a combination of over-crowding, food deficiency, and improper lighting facilities particularly with reference to the mid-day sun. The correction of these conditions cleared up the trouble. Mention was also made of ulcer of the cornea overcome by instituting proper vitamin balance, in one case through the use and instillation of cod liver oil.) Loss of hearing also may be due to many causes, some minor, and many local and constitutional. Diseases such as scarlet fever, and luetic conditions are sometimes very rapidly destructive to the ear. Other causes relate to the sinuses, to allergic conditions, to certain pathology of the stomach, eczema, certain fungi, and even to certain foods. Examinations thus must often go farther than the eye and ear; they must include the patient almost generally, and sometimes even his living conditions. Practically all eye and ear conditions excepting from injuries are secondary, and while the cure needs attention *per se,* the patient needs to have the primary cause relieved whatever that cause may be.

THE business meeting resulted in the selection of the meeting place for the Forty-Fourth Annual Meeting, in 1941, as Louisville, Kentucky. By proper action, however, the authority was reserved to the President and the Secretary-Treasurer to select some other place if, for any reason, the holding of the meeting in Louisville should appear inadvisable. DR. THOS. H. HANCOCK, of Atlanta, DR. D. E. SHIELDS, of Morristown, Tennessee, and DR. J. A. WHITE, of Richmond, Virginia, were elected Honorary Members. The election of officers resulted as follows: *President,* DR. HUGH S. BLACK, Spartanburg, South Carolina, *First Vice-President,* DR. M. MOODY, Tuscaloosa, Alabama; *Second Vice-President,* DR. G. M. FLEMING, Cleveland, North Carolina; *Third Vice-President,* DR. J. I. HUGGINS, White Pine, Tennessee; *Fourth Vice-President,* DR. JACOB SCHULZ, Middlesboro, Kentucky; *Recording Secretary,* DR. W. W. HARPER, Selma, Alabama; *Assistant Recording Secretary,* DR. J. MARSH FRERE, Chattanooga, Tennessee; and *Secretary-Treasurer,* MISS EDITH FOLTZ, Washington, D. C.

Related activities of this meeting included a broadcast at 12:45 P.M. on Tuesday, over the local Columbia station by DR. F. WEBB GRIFFITH, giving the substance of his opening remarks as here published, and by DR. W. A. BOYD, on the work of the Association. There was also the picnic on the Isle of Palms, Thursday morning, June 6, under the auspices of the Ladies' Auxiliary of which MRS. G. I. JONES, of Washington, D. C., is President. Following the shore dinner at Isle of Palms, the Annual Meeting of 1940 was adjourned.

Acute Suppurative Arthritis

—A Simple Method for Treatment—

J. PAUL KENT, M.D.,
Altavista, Virginia

IT SEEMS rather foolish for a rural practitioner to attempt to discuss the treatment of such a complex disease as acute suppurative arthritis, especially since so many leading auththorities disagree as to the proper course of treatment, but the results obtained have been so striking by the use of a simple method in the home, namely aspiration and air insufflation, that I feel justified in reporting only three cases.

Suppurative arthritis is most commonly due to staphylococcus aureus or streptococcus hemolyticus, and next in order are the pneumococcus, the gonococcus, and meningococcus. The disease is more common in children but is frequent also in adults. It is thought that trauma may cause the localization of a systemic infection.

Purely traumatic arthritis is usually characterized by the presence of blood in the synovial fluid. Infectious arthritis has either serous, serofibrinous or purulent fluid formation in the joint depending upon the severity of the condition.

Serous effusions are usually absorbed and recovery takes place spontaneously, but the outlook in serofibrinous and purulent effusions has been rather discouraging; frequently there is a limitation of motion in these joints.

The suppurative type is characterized by more marked symptoms. Locally, there is extreme pain, swelling, and heat of the joint. The systemic

reaction is extreme with a marked elevation of temperature. At times, one may be able to demonstrate the focus of infection, for example, infected tonsils, abscessed teeth, and urinary tract infections, as pyelitis or gonorrhea.

Heretofore, the treatment has varied to a great extent. The serous types have been treated by simple aspiration. The purulent types have been treated by aspiration and irrigations of different antiseptic solutions. Others have treated purulent cases by drainage with active mobilization, drainage, immobilization and traction, and by incision of the joint followed by joint washing.

All of the cases that I am reporting in this paper are the purulent type, and I have been able to get a positive culture in only one of the three. It appears to me that most authors have been able to get a positive culture in only a small percentage of their cases.

First, allow me to state that air insufflation is not an original idea, since I attended the Medical College of Virginia and am acquainted with the work of Drs. Porter and Rucker in the use of air insufflation for the treatment of acute gonococcal synovitis. No one has reported to my knowledge the use of air insufflation in the treatment of acute suppurative arthritis, non-gonorrheal.

IN THIS treatment, the skin is sterilized with some antiseptic preferably iodine and alcohol, and a 20 gauge two-inch needle attached to a 50-cc. syringe is introduced into the synovial cavity. All purulent discharge is aspirated that it is possible to obtain, then the syringe is disconnected from the needle. The plunger of the syringe is then withdrawn to the full capacity of the syringe, and the syringe is re-attached to the needle. The joint space is filled with air by forcing it out of the syringe with moderate pressure on the plunger. In the knee joint, air is injected until the patella floats freely above the tibia and femur. In other joints, air is injected until the joints are well distended. After about 48 hours most of the air has been absorbed; it has been my practice at this time to re-aspirate and refill the joint with air and thereafter repeat every 48 hours as deemed necessary according to the progress of the case. None of my cases has necessitated more than three treatments; the most of my treatments have been given in the home.

Case No. 1: Mrs. E.T.H. called me on February 14, 1938, about 4 A.M. suffering from acute pain and swelling of her right knee with onset 24 hours previously. She could not bear for the leg to be moved on the bed. About six weeks previously, I had treated her for an attack of pyelitis and auricular fibrillation. She had had several other attacks of pyelitis and cystitis during her lifetime, otherwise per pH was negative. F.H. was negative. Physical examination showed a 79 year old female lying in bed in acute pain, T.102.6, P.24, heart was irregular, lungs clear and abdomen negative. Right knee markedly swollen, hot, red and definite fluctuation was present. About 2 oz. of purulent fluid was aspirated from the knee and the synovial space insufflated with air.

Purulent discharge was not cultured for bacteria.

Progress Notes: February 15, 1938, patient has been comfortable since treatment yesterday and able to handle her limb herself in bed and to markedly flex the knee joint. T.99.4, P.100. February 16, 1938, patient still comfortable without anodynes, knee slightly swollen and red. About 10 cc. of purulent fluid was aspirated and the knee joint refilled with air. February 18, 1938, T.98.6, P.90, nothing obtained and joint refilled with air. At this time, patient was allowed to walk with crutches. Ten days following the initial treatment the patient was walking unassisted. Eighteen months after this illness, she has normal function and mobility of this joint with no recurrence of trouble.

Case No. 2: Mr. R.L.B. was first seen June 24, 1938, complained of pain in left knee on motion, He stated that on the night before while down on his knees working on a piece of machinery in usual employment, pain struck him in the knee, and he was claiming compensation for this disability. He had been sent to me by his employer as a compensation case. At this time, examination revealed a white male, age 35, T.99, P.80, well developed and apparently a healthy individual; he showed many carious teeth, and tonsils were cryptic and badly inflamed and pus exuded from both on slight pressure. Blood pressure 130/80, heart and lungs normal, abdomen negative. Left knee slightly swollen, hot and erythematous. There was pain on either active or passive motion of the left knee joint. Upon further questioning the patient could not recall any particular time that he injured his knee but blamed the trouble on his work since the pain hit him while crawling around under machinery. I explained to him that the trouble in his knee was apparently an inflammatory process and not a case of injury, and I tried to elicit a history of any previous trouble but could not.

Progress Notes: June 26, 1938, two days later, his knee was markedly swollen, hot and fluctation was present, T.101, P.90. I told the patient that a correct diagnosis of the case might alter the treatment so as to prevent him from having a stiff limb for life, after which he stated that he had been thinking about the matter since he saw me, and looking back he remembered that the knee had been sore two or three days before date of alleged injury. At this time, a diagnosis of acute suppurative arthritis probably resulting from diseased tonsils was made, and 40 cc. of purulent fluid was aspirated from the joint, and filled with air. Large doses of anodynes had been required previous to this but none was needed after the first aspiration. The temperature rapidly dropped to normal. The second aspiration was done on June 28, 1938, obtaining 10 cc. of purulent fluid, and again the joint was filled with air. On June 30, 1938, the needle was inserted, but no purulent fluid was obtained, and the joint was filled again with air. After the

second aspiration, the patient was walking with crutches.

Culture of the fluid aspirated showed staphylococcus aureus. Two weeks after the initial air treatment, tonsils were removed under local anesthesia in my office, and three weeks from onset of the illness the patient was walking without crutches. Twelve months after recovery he has had no recurrence of trouble.

CASE No. 3: Mrs. G.C.P. first came to me on November 11, 1939, complaining of excruciating pain in right wrist with slight swelling and redness over the distal end of the radius of two days duration. The patient had been well for some time until the present illness. She had had a spell of neuritis and rheumatism several years ago, at which time she had all of her teeth extracted. Her past history was otherwise negative. Examination on November 11, 1939, revealed a white female, age 63, rather slender and thin in appearance but apparently in fairly good general health, T.99, P.90, blood pressure 210/90 and pulse irregular, tonsils small and cryptic, complete false upper and lower teeth, lungs clear, heart irregular but no murmurs heard, abdomen negative; right wrist showed slight swelling, heat and erythema. Salicylates and codeine were prescribed along with thiamin chloride.

Progress Notes: November 13, 1939, two days after the first visit, T.101, P.110, the patient was suffering much worse and was unable to sleep in spite of heavy doses of salicylates and codeine, and swelling was increased a great deal. X-ray of the wrist at this time, showed no involvement of the bone. The wrist was aspirated and only about 10 cc. of purulent fluid obtained, and filled with air. Before this aspiration the patient complained of unbearable pain on slightest movement of the right arm; in less than one half hour after the aspiration and air insufflation, she fell asleep for several hours. On my visit the following day, November 14, 1939, I found the patient sitting up in bed smiling, and she announced that she had been to the bathroom and taken a bath herself that morning. November 15, 1939, two days after the first aspiration and four days after the first visit, the patient came to my office with normal temperature and feeling fine. An attempt was made to reaspirate but nothing was obtained, and the joint was filled again with air. The patient has had no further trouble with this wrist.

Culture of the fluid from this joint showed no organisms.

CONCLUSIONS: (1) Three cases of acute suppurative arthritis have been successfully treated with aspiration and air insufflation without the use of an antiseptic irrigation in the joint.

2. A simple method of air insufflation has been described.

3. One case illustrates the responsibility of the industrial physician to the employer in establishing the correct diagnosis.

4. In all of my cases there has been a dramatic and permanent relief of both local and constitutional symptoms.

5. In one to three weeks there has been a return to normal function.

6. Anodynes have not been needed in any of the cases after the first air insufflation.

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4. SHANDS: Handbook of Orthopedic Surgery, p. 122.

Industrial Health Clinic

—Muskegon, Michigan, June 28, 1940—

(Reported by C. O. SAPPINGTON, M.D., DR. P.H.)

SAID to be the first of its kind, a clinic on health in industry under the auspices of the Muskegon Employers Association, the Employers Association of Grand Rapids, and the National Association of Manufacturers was held at the Occidental Hotel, Muskegon, Michigan, June 28, 1940. This meeting signified a further long step in the development of industry's acceptance and recognition of its social responsibilities, and of its obligation, not only to provide jobs, but to help safeguard the health of the workmen who fill them. The sessions involved the experience of leaders from the medical profession, personnel authorities, industrial hygienists, industrial safety engineers, and employers. The program follows:

MORNING SESSION: Welcome—MR. G. W. CANNON, Vice President, Campbell, Wyant and Cannon Foundry Company, Chairman of the Sponsoring Committee.

"The Meaning and Value of Industrial Health — as analyzed by the State Health Department" — DR. K. E. MARKUSON, Director, Michigan Bureau of Industrial Hygiene.

"— as evaluated by the State Medical Society"—DR. HENRY COOK, Chairman, Michigan Committee on Occupational Disease and Industrial Hygiene.

"— as experienced by the Manufacturer"—MR. H. M. TALIAFERRO, President, American Seating Company.

"Organization and Costs of an Industrial Health Service" — DR. C. M. COLIGNON, Medical Director, Campbell, Wyant and Cannon Foundry Company.

"Policy and Value of Pre-employment and Check-up Physical Examinations in Industry" — DR. G. C. PENBERTHY, Detroit.

LUNCHEON: "Industrial Health and National Defense" — DR. VICTOR G. HEISER, Consultant, N.A.M. Committee on Healthful Working Conditions.

AFTERNOON SESSION: "Better Employment Relations Through a Health Program" — DR. A. F. LECKLIDER, Personnel Director, Fisher Body Corp.

"A Plant Health Program and Public Relations" — MR. RALPH L. LEE, Department of Public Relations, General Motors Corporation.

"Information Please" — DR. C. O. SAPPINGTON, Panel Leader.

Open questions to a board of experts consisting of

(a) Industrial safety engineer — MR. CARL WOOLIEVER, Buick Motor Division.

(b) Industrial physician — DR. C. M. COLIGNON, Campbell, Wyant and Cannon Foundry Company.
(c) Industrial hygienist — MR. WARREN COOK, Zurich General Accident & Liability Insurance Company.
(d) Employment relations executive — DR. A. F. LECKLIDER, Personnel Director, Fisher Body Corp.

MR. G. W. CANNON gave the official welcome on behalf of the various agencies represented. It is the purpose of this conference to face the problems of employee health in which both the medical profession and the employers are involved. Industrial relations has been under scrutiny for the past decade, and this also applies to health relationships. The average age of industrial employees has increased. Management now realizes its responsibility with regard to health conservation. The tremendous losses due to ill health among industrial employees has been the means of stimulating action with respect to health conservation. The activities of the Committee on Healthful Working Conditions of the National Association of Manufacturers have pointed the way for progress. It is hoped that this is the first of a series of meetings, through which much education can be accomplished through the leaders in the various phases of employee health promotion.

DR. K. E. MARKUSON, in speaking on "The Meaning and Value of Industrial Health, as analyzed by the State Health Department," was privileged to be a member of the conference under such sponsorship. He believed that under such auspices the conditions were more favorable than when conducted by the so-called official agencies. The National Association of Manufacturers was to be congratulated on its activities in this respect.

The Bureau of Industrial Hygiene of the State Department of Health of Michigan is now being reorganized. Beginning July 1, the central bureau will be located at Lansing, with other bureaus being located at Flint, Grand Rapids, and Saginaw.

In the State of Michigan, there are two official agencies which have to do with Industrial Hygiene procedures, the Department of Labor and Industry and the Department of Health; in the former there are 14 inspectors competent to do safety inspection, possessing legal authority to issue orders, but it must be acknowledged that they do not have the facilities for carrying out direct industrial hygiene investigations. The Health Department on the other hand, is set up to act in this capacity and to give advice, although no orders or rules are issued. Reports are made to the management and are strictly confidential. It has been found that control measures are both humanitarian and economical in their aspects.

It has been shown that occupational diseases account for only a small part of the loss of time resulting from absenteeism, that 15 times as much loss occurs from non-occupational diseases. Dublin's figures of seven years less life expectancy among industrial workers than among the general population were quoted. There are also increased rates for pneumonia and tuberculosis among industrial employees, as compared with the general population.

Physicians can be of much assistance in this work and every plant should have the services of an industrial physician in these programs. It is realized that it is difficult for the small employer to put on such a program, but these small groups can be reached through various units in industrial hygiene and through local physicians.

It should be kept in mind that the medical work done is of the case-finding type only and that preventive procedures are especially emphasized. Among the problems in this service there are:

1. Control of industrial exposures by engineering procedures.
2. Pre-employment and periodic examinations of employee.
3. An investigation of the high incidence of adult disease, which demands the cooperation of all agencies.

Among the important factors of industrial hygiene programs may be mentioned:

1. Preliminary surveys.
2. Detailed follow-up studies of industrial environment.
3. Recommendations for engineering and medical control.
4. The reporting of occupational diseases.
5. Cooperation with and provision of information for various types of groups interested.
6. An educational program for the various agencies.
7. An attempt to make industrial hygiene courses a part of the regular medical school training.
8. The reporting of findings to industry personally.

Examinations are the real basis for the program and must be thorough for proper placement, which is the real objective.

Although it is difficult to place a price tag on the benefits because of various intangibles, nevertheless health is among the greatest of assets of the human race; some of the benefits may be listed as follows:

For the employee (1) increase of life span and productivity; (2) an improvement in the health and capacity for enjoyment; (3) prevention of interruptions in pay; (4) the engendering of friendly employee-and-employer relationships; and (5) continuity in employment, making the healthy worker a better defender for the nation.

Benefits for the employer may be mentioned as (1) decrease in compensation and insurance costs; (2) decrease in production costs because of continuity of production; (3) decrease in absenteeism; (4) decrease in labor turnover; (5) increase in production rates; (6) less labor trouble; (7) better employee-employer relationships; and (8) the good will of the community.

As an official agency, the Health Department of the State of Michigan offers its wholehearted co-

operation in the hope that his is only the beginning of a long and successful program.

MR. H. M. TALIAFERRO, discussing "The Meaning and Value of Industrial Health as experienced by the Manufacturer," stated that every community is made up of people trying to make a living and that, therefore, any factor interfering with this normal condition is a distinct cause of losses. Ill-health is certainly one of the vital factors concerned. At this time, if cooperation could be obtained from the various agencies involved, millions of dollars would be saved annually. Good health and safety measures as carried out by the unit plant in the unit community forms the basis for accomplishment. This is a common meeting ground for all; therefore, community health is important to every manufacturer.

Nothing of importance is possible without health. Every manufacturer is concerned with cheaper and increased production and in striving for this objective, must keep in mind that (1) the interest of the customer must be maintained in value; (2) the economic interest of the employee must be held in balance; (3) likewise the interest of the investor must be maintained; and (4) the proper balance must be maintained in the community. Let one of these get out of balance and all others are affected.

Management must, therefore, act as a referee in keeping this balance of the various groups and must use all modern facilities to accomplish this end. All such factors must be weighed and satisfied relationships maintained in a well-rounded health program.

It is now becoming increasingly evident that individual health is a problem far beyond the control of each individual; therefore, the cooperation of all agencies concerned will be necessary. Along with this goes the concept that the health of the community is vital to progress.

The figures of the National Health Institute were quoted relative to six million persons being incapacitated for work on an ordinary winter day. As an example of what costs were in one plant, five cases of absenteeism cost $4,439.00 in wages. As a further example of improvement, in 1928 for every day lost by accident, there were 11.3 days lost because of sickness, which was ultimately reduced in 1939 to 4.9 days.

In 1921 the company put on a full-time nurse supervised by a physician on part time, who called every day at the plant. Pre-employment and periodic examinations were instituted; a visiting nursing service was started for absenteeism. A service for the examination of eyes was also installed and glasses were provided on an installment arrangement. X-rays of chest were taken of all men in dusty occupations, both before and subsequent to hiring. Group hospital arrangements have been made on a voluntary basis through the Michigan Society. Last year tuberculin tests were given to approximately 90% of the employees, and x-rays of the chest were taken on all positives with the findings explained to each employee. One case of active tuberculosis was found in this group, and others when necessary were advised to have periodic check-ups.

Red Cross first-aid courses are given at stated times, and the plant is very proud to say that it has obtained the American College of Surgeons' certificate in fulfillment of requirements laid down by that group.

Finally, it must be remembered that community health is behind individual health, which is so essential in a defense program.

DR. HENRY COOK discussed "The Meaning and Value of Industrial Health as evaluated by the State Medical Society."

It is impossible to cover all phases of this question, but some factors are vital to all participants.

There should be more interest in the small employer.

Through the Council on Industrial Health of the American Medical Association and the appointing of committees in the state and county Medical Societies, in this state a survey of facilities and needs has been made.

Instruction can be conveyed through addresses, seminars, and meetings similar to this one. Stimulation of interest must be obtained in the county medical societies. Interest lags because the demand has not yet been made by the manufacturers for the use of general practitioners.

Although progress has been made, the profession has not shown the interest it should, but the demand for services should come from industry. Tact, patience and understanding are all necessary in cooperation with regard to this problem. The program must have the cooperation of the worker, the employer and the medical profession.

It is important to know that 65% of the industrial workers of this country are cared for by private practitioners and this work must be put on an ethical basis, if the proper results are to be achieved. It is a question whether the small industrial group can provide a competent examination.

It is up to the industry to find the conditions that need remedying and then it is up to the physician to correct the conditions.

In the selection of physicians for this work, the employers should select men who are really interested. Defects should be corrected by the family physician.

In closing. it is to be emphasized that the medical profession will cooperate in these programs to the fullest extent.

DR. C. M. COLIGNON presented the subject, "Organization and Costs of an Industrial Health Service."

Before any intelligent discussion can be made of the subject of organization and costs of an industrial health service, there are special problems peculiar to each plant which must be considered, such as the number of employees and the turnover; and also the nature of the work.

It is recommended that all organizations start with the bare essentials and gradually expand as necessity indicates. Most industrialists fear the cost of these services, although they realize at least to some degree that they are losing a great deal of money because of the lack of preventive facilities.

It is believed that the good old-fashioned physical examination is the best type to use.

Lantern slides were used to good effect to show the facilities of the medical department, from the time the employee fills out his application blank to the very last tests made. Especially to be emphasized is the occupational history of previous employment which is given a great deal of consideration by a special history taker.

A plan of the department was shown, also record forms of the history and the examination blank. Laboratory facilities and examination and dressing rooms were shown, as well as a special department for women. X-ray facilities are provided, as well as a minor operating room. A rest room is also provided for those who appear to be nervous or whose blood pressures or pulse rates need attention. A special eye examination room was also shown and visiting nursing facilities by the use of automobiles were also depicted.

In every instance, blood has been drawn for a Kahn test and there has been no objection on the part of any employee. Routine urinalyses are also done on every applicant.

The company provides the facilities for making dust determinations in the plant and a laboratory for the purpose of examination of specimens. Light tests for efficiency in illumination were shown as done by illuminometer tests.

Among the benefits which have accrued from this service are (1) the decrease in insurance costs (the manual rate being $3.78, which was subsequently decreased to $3.02 and $1.43); (2) improved workmanship; and (3) decreased cost in breaking-in new employees.

DR. G. C. PENBERTHY concluded the morning session with a general discussion of the subject "Policy and Value of Pre-employment and Check-up Physical Examinations in Industry."

This discussion was limited particularly to observations made on injured workmen, during the making of check-up examinations before return to work. All individuals should be encouraged to work and this should be kept in mind during the making of the examinations for employment. There is great need for the classification of those who are handicapped.

Examinations can provide the basis for shorter periods of morbidity, earlier recovery, and lower monetary loss. Examinations of this type should always be considered an integral part of overhead.

One of the problems is the development of neuroses which can really be avoided by careful attention during follow-up examinations.

It is especially to be emphasized that the employee's physician should contact the employer in his relationships to the industry.

In a large series of check-up examinations there was no evidence to show that there was a tendency to the development of malingering or anxiety.

It should be emphasized that the examinations when properly used can be a factor in the heightening of the morale of the employee.

MR. HARRY KELLY briefly discussed the remarks of Dr. Cook and believed that there was no failure on the part of industry to cooperate fully with the medical profession. In the treatment of minor complaints, such as colds, industry looked to the medical profession to say how far this type of work should go. With regard to optometrists, in the early days it seemed entirely impossible to interest a physician-oculist in this type of work but it was later discovered that oculists gradually became interested.

AT THE Luncheon Session, Mr. G. W. Cannon, the presiding officer of the day, introduced Dr. C. O. Sappington, of Chicago, who in turn introduced the luncheon speaker, Dr. Victor G. Heiser, who spoke on "Industrial Health and the National Defense."

Dr. Heiser first discussed the German machine and the Italian build-up and commented that both of these phenomena were entirely due to regimentation, which was the only way to bring order out of chaos in these countries. Reference was made particularly to the custom in Italy of having menu cards with calories carried out opposite the type of food indicated.

However, as much as regimentation has worked in European countries, we of this country do not want to do things that way, but we do want cooperation and unity of purpose.

Great strides were made in the treatment of tuberculosis in Germany and excellent results were obtained in uplifting the standards of physical fitness.

The need for the promotion of physical fitness in this country is very evident when it is remembered that 32% of our men were rejected in the U. S. army draft during the past World war.

It is of course to be remembered that large industries are well organized and have excellent programs. However, 65% of the workmen of the country are to be found in small industries where conditions are entirely inadequate for taking care of the health of employees. Nowadays industry cannot afford to be without a medical service.

When industrialists are interviewed, they frequently do not know whether it pays in dollars and cents to have a health service but when asked if they would give it up, the reply is always in the negative.

Allusion was made to a recent meeting in Washington with reference to physical examinations, in which labor representatives were against the use of such examinations and greatly regretted such examinations being made the basis of discrimination. An intelligent point of view must be brought to bear on this situation and the real benefits of examinations explained to the workers.

Mechanized warfare demands the continuous manufacturing of products and the efficiency of workers in manufacturing processes.

Dr. Heiser closed by quoting Woodrow Wilson: "The greatest efficiency comes from the voluntary cooperation of a free people."

DR. A. F. LECKLIDER opened the Afternoon Session with a paper on "Better Employment Relations Through a Health Program."

Employee relations means employee attitude, which is frequently based on what the employer is doing to discharge his responsibility. Such responsibility applies as much to health procedures as to other activities.

It has been agreed that in medical services certain safeguards be set up for the physical safety of employees, that they should be protected from occupational diseases, the latter of which can be in compliance with legal requirements or greater than the legal requirements.

There are two concepts which are important to us in considering industry's responsibility, these two being the examination of new employees, and the pinciple of seniority. Seniority is used very much differently than formerly. In other words, industry has a definite responsibility after the establishment of seniority, more than was formerly held.

In most instances in industry, the reason for an examination should be predicated upon proof of physical ability to do the job and also the assumption of compensation liability.

It must be said that industry is responsible for healthful working conditions and for safe conditions of work; that there should be definite knowledge of occupational disease hazards, and that this knowledge should be authoritative, including the selling of the principle of protection to employees; there should be a clean, well-manned and well-run dispensary; there should be provision for low-priced group insurance; there should be effective cooperation with local health agencies; accident care is a definite responsibility; health advice can be given on request, as has been done in many instances; care of plant sanitation; control of contagious diseases, which is also important in connection with return to work.

In summary, it was stated that the management has adopted no *laissez faire* attitude—that it wants to do the job well. Improvements, however, can be expected on the plan of health maintenance. It is well to take care of all the health hazards first and it is furthermore important to bring well people into the plant as new employees. Outside agencies are cooperated with actively. Finally, it is of great importance to arrange that the supervisory force knows the policies of the department and realizes what the objectives are.

MR. RALPH LEE discussed the subject "A Plant Health Program and Public Relations."

Public relations can be simply defined as the relationship of the organization with the public. This does not necessarily include activities which are designed for the promotion of good will.

It is tantamount to realize that the reactions depend largely upon public opinion. No institution can have a satsified relation with the public if the occupations in that organization injure the health of its employees.

A protective program against occupational diseases is no longer a debatable question as a business procedure and is, therefore, not a public relations problem.

However, over-all health activities more than pay for themselves, so no business concern can afford to neglect the health of employees in relation to lost time. When industry does this, it is also serving the best interests of the community at large, which is an effective means of maintaining good will. All of this, however, must be done without paternalism.

A clear-cut distinction of medical jursidiction as between plant physicians and local physicians can really be the basis for satisfactory progress for all concerned. The plant physician can be of invaluable service to employees as a counselor.

It must not be forgotten that part-time medical men can benefit in public relationships with regard to the services which they render a plant.

The first principle of public relations is to prove the proper basis for the products manufactured and the sevices rendered by any organization. Any activity therefore to be of value must conform with this principle; a health program does and this conception obviously must be the guide.

It is, therefore, concluded that good public relations and good health programs in industry go hand in hand.

THE afternoon session was brought to a conclusion by an informal panel of experts who answered questions relative to Industrial Safety Engineering (Mr. Carl Woliever); Industrial Medicine (Dr. C. M. Colignon); Industrial Hygiene (Mr. Warren Cook), and Employment Relations (Dr. A. F. Lecklider.)

DR. C. O. SAPPINGTON, of Chicago, was the panel leader and called for questions from the floor and submitted them to the panel.

The greater number of the questions involved administrative medical work in industry and ethical relationships of practitioners. Additional informative material was given with regard to industrial safety and industrial hygiene by the experts on the panel.

A short closed dinner meeting was held by the Muskegon County Medical Society as a conclusion to the day's activities, at which Dr. Victor G. Heiser talked very briefly on the responsibility of the general practitioner in industrial medicine.

It is believed that this type of meeting is the forerunner for similar meetings in various portions of the country. Certainly much is to be gained by the employers and the medical profession sitting across the table from each other and discussing their problems frankly. It is understood that plans are already being formed for the holding of similar meetings in other localities.

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Our Kind of Efficiency

A RECENT comment on the innumerable wars of the past, remarks that the important wars of history have been won by those peoples who lived most efficiently. To those who think of efficiency as primarily a matter of schedule and pattern, ruler and stop-watch, this might imply that the present conflict will result in totalitarian victory. There are many on this side of the water who think of efficiency that way—the politics of regimentation, planned economy, and administrative regulations as contra-distinguished from statute law (to name but a few of their vagaries), are an expression of that kind of thinking. The masses and their activities in step with the master mind!

The fact that totalitarian powers elsewhere have enemies and regimentation proposals here have opponents, indicates that there may be another kind of efficiency. Those who know what it is, and, from thought and experience, understand it best might reasonably view it as a synonym of "sufficiency." Not the smug inertia of complacency, but the kind of sufficiency that permits us individually to be efficient because we each want to be rather than because someone tells us that we have to be, and enables us collectively to put ourselves in the position of being sufficiently ready to be efficiently formidable. In other words—the significant words of Woodrow Wilson, himself an historian: "The greatest efficiency comes from the voluntary cooperation of a free people."

We as a free people are now cooperating in the matter of national defense. It is assurance of the fact of being a free people, that we are cooperating voluntarily. From the standpoint of defense against modern attack, it is a new kind of cooperation. The skilled worker now is of equal importance with the man under arms; the unskilled worker now is as important as the man under arms used to be. Everybody who works is in the army; industrial production is as vital as the bearing of arms. Loss of working time, particularly as to the workers who are most skilled and thus most difficult to replace, becomes a casualty as disturbing to efficiency as a wound in action.

A difference is that loss of working time is preventable. And every agency that can be brought to bear in prevention is voluntarily cooperating.

Two of the most important agencies in this behalf are the industrial physicians and the industrial hygienists. Their place and the scope of their preventive activities are too well established to need comment here. The significance is that their cooperation was offered early, and unitedly, and unreservedly—in the spirit of the kind of efficiency Woodrow Wilson defined; and has been accepted in the same fine spirit as that in which it was given. Guarding the workers against preventable disability is front-line service, and the physicians and hygienists who have volunteered to do it are the kind of Americans who do not need uniforms to be patriots.

Industrial Health Clinic

TIMELY in its inception and fortuitous in every circumstance, was the "Clinic on Health in Industry," held at Muskegon, Michigan, June 28. The first meeting of its kind, the "Clinic "was called by industry so that manufacturing experts might confer with medical and technical experts in the problems and procedures to insure good health and safety in the factory.

As an experiment in setting up a means for the free interchange of thought between manager and technician, this meeting was highly successful. "Much is to be gained by the employers and the medical profession sitting across the table from each other and discussing their problems frankly." Meetings of this kind will give them the opportunity to do that, and it is hoped the interest and value in this beginning may be permanently available in continuation through meetings from time to time in other industrial localities.

The interest in the initial gathering is shown by the character of the attendance. Of the total of 225 at the sessions, 30 were physicians, 14 were safety men, hygienists, nurses and others within the technical field, while practically all of the remaining 181 were operating executives or officers of their companies. This was a large, and a significant, majority of production men, wanting to learn more about the methods of protecting employee health—particularly important at this time when the demands of national defense are so dependent on industrial manpower.

INDUSTRIAL HEALTH AND DISEASE

Organized Medicine and Industrial Health

C. M. PETERSON, M.D.,
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MEDICAL interest in the effects of occupation and environment on health has existed for a very long time. Yet only occasional efforts at improvement took place in this country until about 30 years ago when new concepts regarding responsibility for health conservation among industrial workers began to exert very profound influences upon industry and upon the medical profession. The first in importance was the enactment of workmen's compensation legislation. Once a monetary value was placed on disability arising out of or in the course of employment, it did not take industry long to realize that industrial accidents and occupational disorders are to a very considerable degree preventable. Furthermore, it has been repeatedly demonstrated that health maintenance and proper working environment applied to the worker have very definite favorable effects on rates of industrial production. It is upon considerations such as these that our modern interest in industrial health fundamentally rests.

The private practitioner of medicine, specialist or not, provides 80% of the medical service which industry supplies to its workers either because of statutory requirements or for other reasons. Almost without exception he has confined his industrial activity to case work remedial in nature. It is interesting to classify some of the reasons why the private physician has failed to participate in the fuller aspects of accident and disease prevention and the promotion of health programs among industrial workers, activities which have appealed to and been undertaken by so many extra-professional agencies. The simplest explanation is that this attitude proceeds naturally from the way industrial medicine and surgery have developed. At the outset, interest was almost entirely concentrated on individual problems of surgical repair and rehabilitation. Likewise, medical education has, in the opinion of many commentators, not been at all helpful in developing a real appreciation of the effects of occupation on physical welfare and the best means for improvement. The greater emphasis on individualized study and management of the sick patient has prevented the assignment of attention to the principles of health conservation of groups and the recognition and arrest of incipient diseases which constitute to a very considerable extent the principal motivations behind the whole field of industrial health. There has also been intentional lack of cooperation on the part of many physicians arising out of their real concern that adequate standards of medical practice could not successfully be transferred into the industrial picture because of industry's unwillingness or inability to support them. Physicians have also had other unfortunate relationships with industrial medicine, characterized by lack of essential qualifications on the part of many who have undertaken this type of activity, its not infrequent status as exploited dispensary work under conditions where the "company doctor" attitude is too prominently interpreted as the proper function of an industrial medical service, and the methods used by some physicians to compete unfairly not only in industrial practice but in private practice through industrial connections. Another large contributor to dissatisfaction with certain features of industrial health has been discontent with certain characteristics of workmen's compensation administration, largely centering in absence of qualified medical representation in compensation administration, the illogical limitations both as to time and cost which have been set up in relation to medical and hospital care for industrial disability and in respect to free choice of physician.

Need for Medical Interest

IN SPITE of these unsatisfactory experiences, organized medicine has good reason to believe that industrial health is an important and rapidly expanding province of special medical interest, both in respect to preventive medical practice and public health administration. This opinion is based on the following considerations: There are approximately 50 million gainfully employed workers in the United States, 10 years of age or over, who engage in some nine hundred occupations potentially hazardous to health. A great many, but by no means all, of these hazards are concentrated in manufacturing plants and in those enterprises devoted to the production and transportation of raw materials for the fabrication of manufactured goods. Conditions of employment have demonstrable effects on the productive and life spans of workers which, as has been shown, are most noticeable in unskilled occupational or socio-economic classifications. A great many, but not all, of the uncontrolled industrial health exposures exist in small plants which comprise a considerable majority of the industrial establishments in this country and in which the majority of workers are employed. Most of these small business enterprises are, or consider themselves to be, unable individually to support health programs beyond first aid and physicians on call who treat emergencies and compensable disability. In large plants industrial medical services are of demonstrated value in the reduction of compensation costs, the lowering of absenteeism, the lessening of labor turnover, and elevating the physical welfare of employees. On the average, each male employee can expect to lose approximately nine days of work annually, one day of which is due to accident, and a fraction of a day to occupational disease. The balance of lost time arises from illness not directly assignable to industry. The total cost annually of sickness and injury from all causes in industry is staggering and must be computed in the billions of dollars. Non-occupational health problems affecting as they do the regularity and continuity of working periods, together with the countless subnormal and pathological conditions uncovered through physical examination programs in industry, provide the private physician with an extensive opportunity to assist in the improvement of the physical welfare of employed groups.

Increased Demands by Industry

THERE are two assumptions which can be drawn from this brief recital of the extent and nature of industrial health problems. The first is that demands made on all branches of the medical profession are much more likely to increase than otherwise. The other is that the time has come when the organized medical profession must manifest a constructive interest in the problems of industrial health, must realize their fundamental importance, and must actually do something about it or else relinquish leadership to industry. There are other even less attractive possibilities. This frame of mind is strengthened by the attitude of manufacturers' organizations, trade unions, insurance carriers, compensation agencies, and of the worker himself, all of whom are currently and actively engaged in establishing the economic, social and humanitarian

Read at the County Officers' Meeting, Saint Paul, Minnesota, February 24, 1940; published in *Minnesota Medicine*, June, 1940.

values of control over industrial accidents and disease. If no other stimulus were provided, the extension of workmen's compensation benefits to occupational disease would be reason enough for the present widespread interest. But in addition, technical developments in industry give rise to health hazards multiplying so rapidly as to leave distinct gaps between recognition of the causative agency and the perfection of medical and engineering methods designed to cope with them. Progress will occur only as this lag is overcome by articulating available knowledge regarding occupational health exposures with the practicing medical profession, the industrial plant physician, and with the existing or developing agencies of industrial hygiene in state and local governments.

The Responsibility

THE Council on Industrial Health of the American Medical Association, therefore, believes that medical organization has a distinct obligation to safeguard the standards of medical service in industry both as to scope and to adequacy. To accomplish these purposes it has implicit faith in medical self-discipline and education. We have as a consequence asked for and received in a little more than a year's time, cooperation from most of the medical associations in states where the concentration of industrial activity justifies the formation of cooperative committees on industrial health. A program has been suggested to these committees in the following terms which obviously must be adjusted to fit local circumstances:

1. To develop on the part of all physicians a good understanding of the proper functions of medical organizations in industry. These over and above required medical and surgical care are physical examination, maintenance of suitable records, the adoption and supervision of necessary control measures and the education of the employee to a personal interest in his own physical welfare.
2. To train physicians to recognize and report occupational diseases promptly.
3. To train industry and labor to the value of industrial health conservation.
4. To elevate medical standards under workmen's compensation.
5. To scrutinize all social legislation affecting the health of industrial workers.
6. To clarify relationships between industrial and private practitioners.
7. To improve relationships between physicians and insurance carriers.
8. To establish working relationships with all state agencies interested in industrial health.
9. To extend as far as possible activities of this same description into county medical societies.

It has been a source of very considerable encouragement to observe that already certain of the county medical societies are beginning to organize committees on industrial health, in order to provide for proper leadership in their own communities respecting health measures designed for employed groups and in accordance with local needs. Some 30 such committees have already been formed. These developments are of fundamental importance since it must be conceded that it is in the county society where the acute problems of industrial practice are encountered and where they are most directly dealt with. Interesting contributions in the field of industrial health have already been made by county societies, as for example, the outline of "Duties of a Contract Physician," by the Wayne County Medical Society, Michigan, the plan for the control of extravagant medical testimony developed in the Fulton County Medical Society, Georgia; and the emphasis placed upon the essentially public health function of the plant physician as formulated in certain counties in Michigan where such physicians are deputized as health officers.

Activities adopted by or suggested for committees on industrial health in county medical societies have been presented to the state committees. It is not expected that any county medical society will be in a position to launch a complete program as outlined. The recommendations are offered in some detail in order to present the proper appreciation of the scope of industrial health activity and to suggest one or more projects which the county associations might profitably engage in.

Certain of these activities fall in the field of investigation:

1. A county society committee should have clearly in mind all past actions of the society which refer in any way to industrial medical practice or health maintenance of employed groups.

2. It should establish an index or file of physicians specializing in or giving major attention to industrial practice together with their industrial connections and the scope of service they provide. Recent experiences of the Council indicate that such undertakings are not too difficult if attempted on a county basis and that the knowledge obtained may be extremely useful in defining proper industrial medical objectives.

3. It should establish as much familiarity as possible with the character of industrial operations in the county and the essential industrial health problems of each, whether primarily caused by accidents, by occupational diseases or non-industrial connected illnesses. Without some attention to the collection of such information, a clear idea of the extent of the industrial health problem in any community will be obtained with difficulty. Once the nature of the business is known, many publications will be helpful in determining potential occupational hazards.

4. The committee should survey the relationships existing between the physicians in industry and (1) employer; (2) employee; (3) private practitioners. It is hoped that shortly the Council may provide a statement on the essentials of industrial medical service which will serve as a common ground of agreement for all parties concerned.

5. It should direct a great deal of attention to the needs of the small plant and how the private practitioner can, under county society guidance, bring to such establishments the advantages of health maintenance through physical examinations, plant sanitation, control of hazardous materials and processes, and health education of workers. This is on all counts the greatest contribution the medical profession can make in the field of preventive medical practice. Certainly the field is almost unexplored and offers a sufficiently large number of individual health problems to keep a great number of physicians busy for years to come. To assist the medical profession in the development of such services, the Council has projected a series of articles on medical organization in industry.

Other activities fall under the heading of correlation:

1. The committee can list the other community organizations which have or ought to develop an interest in industrial health problems.

Contacts should be established with—

Local health departments.

Industrial and public health nursing organizations.

Safety and industrial engineers or organizations.

Local hospital council.

Social and welfare agencies, as for example, health associations, tuberculosis clinics, venereal disease control committees, etc.

Associations of Commerce or local manufacturers' associations.

Local labor council.

Casualty insurance adjusters and brokers.

Local bar association.

Adjudicating agencies — courts, compensation commissioners or medical representatives thereof, and arbitrators.

2. The committee should determine whether any of these agencies are in a position to contribute to the physical betterment of the workers along lines which private practitioners might have difficulty in providing or which small plant owners might have difficulty in financing individually.

Most important is education. In respect to professional training, it has been suggested that county societies can:

1. Use their influence to improve undergraduate training in fundamentals of industrial health.

2. Attempt to develop an educa-

tional service through meetings of the county medical society based on knowledge gained of local occupational exposures.

3. Attempt to acquaint physicians with true relations between trauma and disease.

4. Educate the profession to the best available means for the early recognition of intoxications or other occupational diseases.

5. Inform the profession of the statutes requiring the reporting of occupational diseases and strongly urge full compliance.

6. Request the inclusion of industrial health training in postgraduate courses under state society sponsorship.

7. Investigate the desirability of a section on industrial health in the scientific assembly of the state medical association.

There will be excellent opportunities for non-professional education, such as:

1. Assisting the industrial nurse to improve her status ethically and professionally.

2. Demonstrating to plant operators the value, both humanitarian and financial, of employee health.

3. Investigating the possibilities for bringing to the worker himself a sense of personal interest in his own physical welfare both inside and outside the working environment.

4. Acquainting the general public with accomplishments in industrial medical practice and the intention of the medical profession to elevate standards in this field.

Occupational Dermatoses

HARRY R. FOERSTER, M.D.,
Milwaukee, Wisconsin

SKIN diseases that develop in the course of employment constitute a unique group. They represent only a small number of the varied dermatologic disorders observed in the private practice of dermatology or in a large skin clinic, and yet they are the only dermatologic group that has been "blue-pencilled" for political recognition. They have thus gained a status of economic importance, and teachers of dermatology have segregated them for special pedagogic consideration.

In the experience of industrial physicians and physicians in industrial communities, skin diseases of occupational origin may loom large and important because of their comparative frequency and their frequent disabling nature. In such practice, however, the importance of non-occupational dermatoses must not be overlooked and the etiologic factor of work must be carefully scrutinized and properly evaluated. While there are some new causes for skin diseases, notably dermatitis, occurring from time to time because of the introduction of new processes or new materials in industry, or because of the development of new industries, the general nature and scope of occupational diseases has changed very little in the last several decades.

Important changes, however, have been made and are constantly being made in workmen's compensation laws and these have focused attention on the industrial dermatoses. In nine states with liberal provisions for industrial disease more than 60% of recorded compensable occupational disease cases in the last five years have been dermatologic.

As you all know, to obtain compensation for an occupational skin disease in Colorado, your Industrial Commission has ruled that it is necessary to prove that such skin disease resulted from an accident sustained in the performance of service arising out of or in the course of employment.

That is how most legislation for skin diseases began, but the definition of accident may be liberalized. In 1911 Wisconsin, the first state to provide for medical care and compensation, applied such provisions to "accidental" injuries acquired in employment. Subsequently coverage was changed from "accidental injury" to "personal injury" and the latter was later defined as "mental or physical harm to any employee caused by accident or disease."

At present 10 states of the Union still withhold recognition of all occupational skin diseases, while 10 other states have laws similar to that of Colorado but they do not all interpret their laws alike. As applied to industrial diseases inclusive of dermatoses, the Colorado law has not been liberalized to the extent reached in at least six other states. You may therefore anticipate that revisions or amendments to your Workmen's Compensation Act are likely to be made some time.

Having studied the development of compensation laws for some years, I have come to believe that in the near future all states will have uniform legislation that will provide medical care and disability compensation in the case of any skin disease for which it can be reasonably proved the employment was the cause, or a major factor in the cause, of its development.

It is simple logic that if a wage earner is entitled to receive aid because of an occupationally acquired injury, similar provisions should be made for occupationally acquired disease, provided it can be established that the occupation was the actual cause of the disease. Likewise if such obligations is recognized and legalized in behalf of the worker in factory or mine it should also apply to the worker in the field. At present the chief obstacle to such liberalization of the law is the cost.

Increased compensation costs are met in part by improvements in industrial hygiene and safety measures. Liberal laws likewise require medical knowledge of diagnosis to clarify doubtful and controversial cases and improved medical skill in treatment to reduce the cost of disability and treatment.

Predisposing Causes

SINCE only about 1% of employees in industry are affected by dermatoses it must be obvious that exposure to certain occupational hazards is not the sole or chief cause of occupational dermatoses. Predisposition plays a very important role. It varies with the type of skin and includes correctable factors such as unhygienic personal habits. Most individuals are protected against the development of occupational dermatoses by a normal tolerance and power of adaptation. The latter explains why a high incidence of dermatitis in a new industry or in a group of new employees is usually reduced in time without changes in working conditions. Individuals with normal tolerance who develop mild manifestations of dermatitis may become tolerant to the irritant through repeated contact and may be continued at such work. Contrariwise, the individual with a hypersensitive skin usually becomes increasingly sensitive with continued exposure until his cutaneous reaction to contact irritation passes physiologic limits and becomes pathologic, dermatitis resulting. Youthful, senile, female and blonde skins possess a physiologic hypersensitiveness. The intact normal epidermis with its oily coating of sebum offers a natural defense against dermatits and is reduced by excessive dryness, sweating, water, soaps and solvents and minor physical injuries. Pre-existing cutaneous disease and abnormalities of the skin such as hyperidrosis, ichthyosis and seborrhea predispose to certain types of dermatoses, as do allergic or anaphylactic states, focal infections, toxemias, constitutional disorders and preceding illnesses.

Exciting or Precipitating Causes

OCCUPATIONAL dermatoses result from exposure to chemical, physical, and infectious agents and may occur in any line of work. It is therefore impractical and unnecessary to enumerate either the dermatoses, the causative materials and agents, or the predisposing occupations. It may be stated, however, that the greatest number are cases of dermatitis resulting from irritant chemi-

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Presented before the Sixty-ninth Annual Session of the Colorado State Medical Society, Colorado Springs, Oct. 7, 1939; published in *Rocky Mountain Medical Journal*, June, 1940.

cal contacts, and that among the predominant irritants are alkalies, especially cleansers, lime and cement, solvents or "degreasers" such as turpentine, naphtha and gasoline, oil and grease lubricants, cutting compounds, plant and vegetable poisons, acids, dyes and dye intermediates, coal tar derivatives, and toxic vapors and dusts.

Physical agents, resulting in occupational injuries and subsequent infections, are probably the commonest causes of compensable dermatoses in Colorado.

Infectious Eczematoid Dermatitis

INFECTIOUS eczematoid dermatitis is the commonest major dermatologic condition occurring in association with occupational injuries. It is a recognized entity that has been culled from the eczema group. It may occur as a direct complication of an injury or as the result of improper medical or nursing management of injuries and it is responsible for the prolongation of disability in injuries and not infrequently for the development of a generalized, resistant, disabling dermatitis.

It is a characteristic of infectious eczematoid dermatitis to begin secondary to and in the immediate vicinity of an open focus of infection with pyogenic organisms, often in skin bathed for a long time in purulent discharges. This condition develops frequently following minor cutaneous injuries that have been neglected or inadequately or improperly treated, and also at sites of draining sinuses as may occur following compound fractures. We have observed it frequently following chemical sensitization of hypersensitive skin consequent to the use of mercurials, iodine, butyn and other preparations in the first aid treatment of minor injuries.

It usually begins with the appearance of localized red edematous macules or of soft papules which, through increasing intensity of inflammation, develop rapidly into grouped vesicles or flat pustules. These rupture and form oozing, raw, edematous patches varying from coin to palm size and larger. Peripheral extension occurs by the formation of new vesicles and pustules and by an undermining of the epidermis at the margins of patches. Adjacent patches then may unite to form larger areas of weeping dermatitis, the discharge being profuse, thin and serous or seropurulent. Outlying single or grouped crusted vesicles and pustules are commonly observed. An inflammatory edema of the involved tissue is a constant feature and regional lymphadenopathy is not uncommon. In the subsiding stages of the disease the patches may be dry and scaly or covered by a thin firmly adherent varnish-like crust that cracks or splits, with exudation of serum or pus. Subjective symptoms are mild but localized exacerbations frequent, and the disease may run a chronic course of many months during which a generalized disabling dermatitis may occur.

Thorough compressing with mildly antiseptic, non-irritating solutions to remove crusts and provide adequate drainage, and the application of an astringent lead or aluminum acetate lotion and a protective, soothing, zinc and starch paste or antiseptic ointment, such as 5% boric acid or 1 to 3% ammoniated mercury are among essential treatment considerations.

Simple Pyogenic Infections

INFECTIOUS skin conditions secondary in importance to infectious eczematoid dermatitis, though occurring more frequently, and occasionally responsible for the development of the former, are pustular folliculitis, furunculosis and related simple pyogenic lesions of impetiginous type following minor injuries. These occur among all types of workers but particularly in machinists and mechanics exposed to oils and cutting compounds and fine particles of metal, and in othere workers engaged in iron, steel, coal or tar industries.

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These lesions develop frequently following simple clogging of hair follicles by oil or grease, inflammation and infection being secondary to mechanical irritation and accidental contamination with pyogenic organisms. However, direct infection frequently occurs following minute epidermal injuries with metal filings and chips. If such infection in a stated instance can be definitely traced to a distinctive occupational exposure, particularly at the kind of work where such occurrences are prevalent, or to a localized minor occupational injury, the dermatosis may be interpreted as accidental in origin. In cases of oil folliculitis and furunculosis there is a characteristic black stippling of the hair follicles of the hands and forearms, and sometimes of the thighs and legs, with follicular inflammation and hyperkeratosis, in addition to the pyogenic lesions. Cutting oils are usually composed of mineral oil, saponifiable oil, sulphur and paraffin. Cutting compounds are made up of mineral oils and emulsifiers soluble in water. Both may cause dermatitis.

Erysipeloid infections of the hands are occasionally seen in handlers of raw meat, particularly of pork or fish and follow inoculation of cuts or scratches with the specific organism, the bacillus of Rosenbach. The inflammation is a low grade diffuse cellulitis, dull red in color, sharply marginated and slowly progressive. It lacks the intensity of erysipelas, but it may be disabling and accompanied by constitutional symptoms.

Rare bacterial infections of occupational origin, usually following cutaneous injuries, are inoculation tuberculosis of butchers and cooks and the postmortem tubercle acquired in the mortuary, anthrax in handlers of fresh hides, wool and bristles, and foot and mouth disease and glanders in those working with cattle and horses.

Protozoan infections as occupational hazards are exemplied by syphilis acquired as a primary infection by nurses, dentists, and physicians. Latent syphilis, activated by injury accidental to work, may manifest itself as a gummatous ulceration at the site of injury. It may be responsible for delayed or incomplete healing of fractures and wounds of soft tissues.

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Fungus Infections

IN this group of infectious dermatoses, nert to bacterial infections in importance and frequency are the various fungus infections, the more important of which should be briefly enumerated. Horses, cattle, sheep and pigs are among the animals that harbor the trichophyton ectothrix or large spore ringworm fungus, which may cause follicular, pustular dermatitis and granulomatous tumors. These occur most commonly on the hands and forearms and about the neck and face of those employed at handling cattle and horses, tending and shearing sheep and slaughtering animals or removing hides. The lesions may be dully inflammatory, infiltrated discoid plaques, with scales and large pinhead-sized follicular papules and pustules at the borders. When present on the scalp or bearded areas they are frequently splitpea to coin-sized elevated inflammatory, boggy papules, nodules and tubercles, studded with postules each of which

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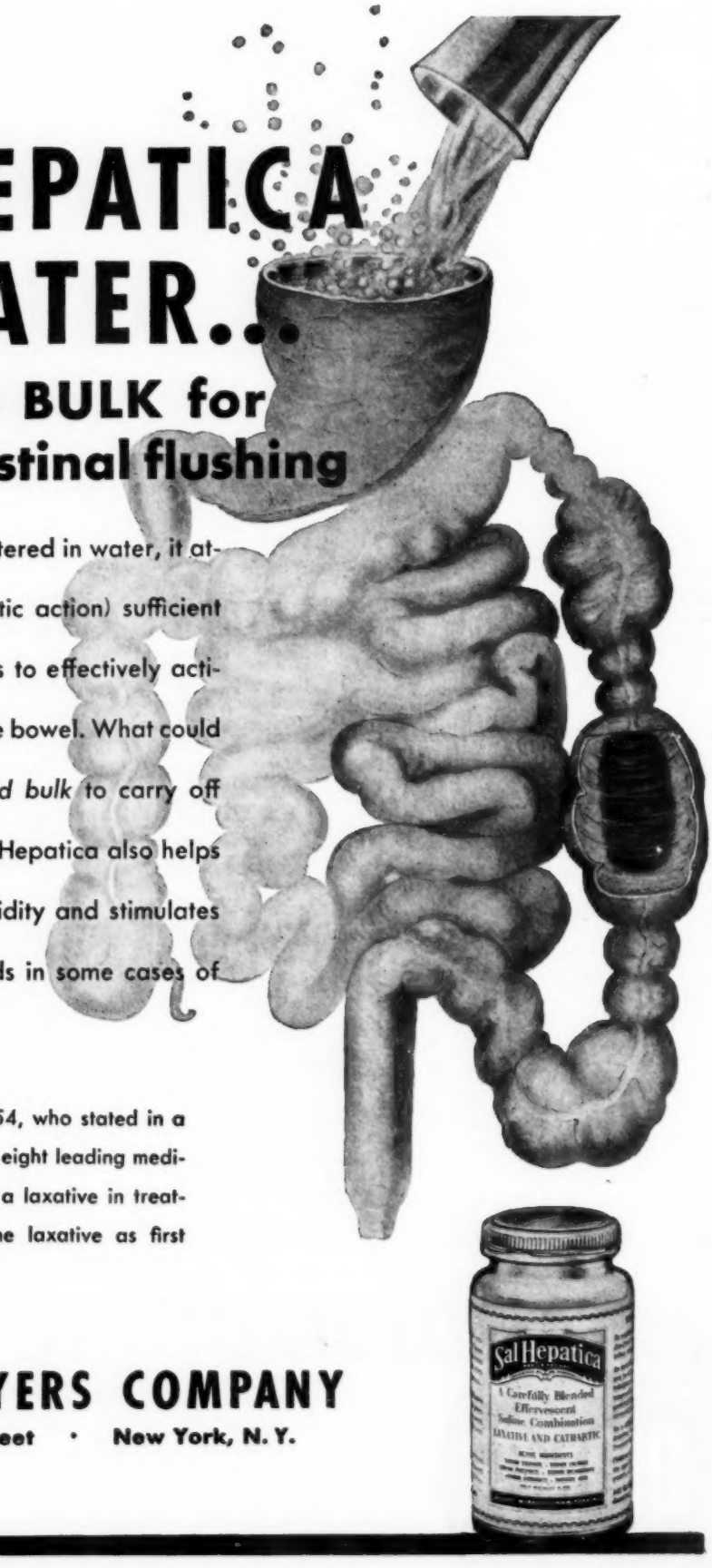

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is pierced by a hair. Most cases develop following hair follicle infection or inoculation of minor unrecalled epidermal injuries, but when directly attributable to a recognized skin injury occurring during employment a case of this type would come within the provisions of your compensation law.

Uncommon and rare fungous diseases such as actinomycosis, sporotrichosis, blastomycosis, coccidiodal granuloma and epizootic lymphangitis belong to this infective granuloma group.

Small spore fungus infections of the epidermophyton or ringworm group, monilia and blastomycetes or yeast infections are more frequent than the preceding types and may have an occupational origin.

Erosio interdigitalis blastomycetica is a superficial erosive, sharply marginated inflammatory yeast or monilia infection involving the webs of the fingers, most commonly those of the first two or three fingers. It is not disabling but may occur in association with paronychial inflammation that may be disabling. It is observed most commonly in laundresses, cooks, housewives and those handling fruit and vegetables.

Related conditions are the monilia and mold infections of the nail folds sometimes observed to occur in almost epidemic form among fruit pickers, packers and canners. These lesions are inflammatory swellings of the paronychial tissue, usually involving more than one finger and not affecting the nail, but often extending beyond the nail fold as a superficial inflammatory process with sharply defined scaly borders. In acute cases pustulation may be present under the nail fold and pain and tenderness may produce disability. These lesions are sometimes looked upon as skin injuries but there is usually no gross traumatic lesion.

Epidermophytosis

THE well-known and prevalent epidermophytosis or ringworm infection of the feet and hands is rarely of occupational origin, but the secondary epidermophytid lesions, which most commonly appear on the hands, may predispose to the development of an occupational dermatitis. The chief importance in discussing epidermophytosis and epidermophytids rests on the frequency with which such cases are confused with contact dermatitis. However, pre-existing infections of this kind are frequently activated or aggravated by working conditions. Such conditions when neglected or improperly treated may develop an infectious eczematoid dermatitis that may be mistakenly attributed to irritant occupational contacts. In fungus infections the lesions, whether desquamative or vesicular, exhibit a tendency to grouping and a predilection for involvement of palms, soles, webs and lateral surfaces of the digits, hands, and feet. In dermatitis venenata, or contact dermatitis, the lesions are more diffuse, uniform and widespread and when vesicular the vesicles are more superficial, numerous, thin-walled and clear. The dry, desquamative lesions of fungus infection are usually sharply marginated, discrete, patchy, concentric or figurated. In the differentiation of these cases a positive trichophyton test or the findings of organisms in potassium hydroxide preparations of marginal scales or blister tops from lesions on the feet or in the groins, are helpful in establishing a diagnosis of fungus infection. The absence of such findings, a history of exposure to irritants, and of periods of improvement on removal from such exposures, with aggravation of dermatitis on reexposure, are factors that favor a diagnosis of contact dermatitis. The trichophyton test, however, like the patch test, may indicate only hypersensitivity from a previous infection or exposure and requires careful interpretation. Sometimes the diagnosis must await the observation of therapeutic results and preventive measures.

Dermatitis Venenata

CASES of dermatitis venenata or contact dermatitis predominate in numbers and importance over all other occupational dematoses in all communities, but are particularly prevalent in metropolitan centers with varied chemical industries. They also present the most difficulties in differential diagnosis. Very few of this type are attributable to accidents and they therefore do not usually come under the compensation provisions of Colorado. However, such cases are sometimes interpreted as instances of personal injury. In Oregon, which has a similar compensation law to that of Colorado, the courts have ruled that poison ivy dermatitis acquired in line of employment, as in road work, is an accidental disease. Similar rulings have been made elsewhere.

There are frequent instances in which a localized cutaneous accident has preceded the development of dermatitis venenata in an individual exposed to a chemical irritant. In such cases the dermatitis develops at the site of the injury, shortly after the accident, as a result of a temporary loss of tissue resistance to the irritant following the injury. An occurrence of this type must be exactly filed as to time and place and site of injury and site of dermatitis by competent witnesses to permit of interpretation as an industrial accident. It is easy for an individual to recall minor injuries that may be merely coincidental.

Cases of dermatitis venenata are due either to contact with a primary chemical irritant, that is a chemical primarily irritating in itself, or to hypersensitivity or allergy, to a chemical that is not ordinarily a skin irritant but produces dermatitis as a result of epidermal allergy, or sensitization of the epidermal cells, to an antigenic substance in the irritant. It is very important to differentiate between the two in determining questions of liability, prognosis, treatment and changes of employment.

For either type of contact dermatitis there are predisposing factors that determine the development of an eruption under certain conditions in a certain previously exposed individual. Any one is liable to develop dermatitis venenata from contact with a primary irritant, though such susceptibility varies in different individuals, and in the same individual at different times. While a minor injury such as a cut or an abrasion may predispose to dermatitis by furnishing a ready portal of entry for the irritant, penetration through the normal impermeable horny layer may occur through a duct or follicle, or as a result of solvent or keratolytic action following prolonged contact. I believe such cases may be regarded as instances of accidental dermatitis under certain circumstances, though they may not meet the legal requirements of a defined accident. Immediate onset of an acute dermatitis venenata following a direct exposure to a recognized irritant may be interpreted as an accident.

In contrast to dermatitis resulting from a primary irritant the dermatitis due to hypersensitivity or allergy affects only a very small number of those workers exposed to any specific irritant. It indicates that there is something at fault with the individual rather than with his work or the materials contacted, though unfavorable working conditions and miscellaneous other factors may predispose to the acquisition of sensitization and subsequent dermatitis.

Dermatitis due to allergic hypersensitivity acquired through occupational exposures must be differentiated from dermatitis due to atopy or inherited hypersensitivity.

Disabling chronic dermatitis, intractable to appropriate treatment, and showing no tendency to recover after prolonged removal from the supposed occupational cause, should always be looked on with suspicion as possibly having been originally a non-occupational allergic condition.

Cases of eczematoid dermatitis in which frequent relapses or recurrences resulted in the development of a chronic eczema that continued indefinitely after discontinuance of employment, are the result of a gradually developed non-specific polyvalent cutaneous sensitivity to substances with which the patient has come in contact in his daily activities. Such cases may be further complicated by secondary bacterial and fungous infections.

Some cases of intractable chronic

eczema of occupational origin, continuing indefinitely after removal from work, occur in elderly employees, of impaired or mediocre physical stock, with obscure foci of infection, degenerative changes in vital organs or defective metabolic processes, all of which contribute to the prolongation of dermatitis and disability.

One of the characteristic features of contact dermatitis is that it is usually symmetrically distributed on exposed surfaces, being most common on the hands and forearms when the irritant is in solid or liquid form, and on the face and neck when it is conveyed by fumes, vapors, or dust. Covered parts may be affected by saturation of clothing. The eruption is usually diffuse, and not sharply delineated at its borders and whether it is erythematous, papular, vesicular or exudative depends more upon the intensity of the irritant properties and the susceptibility of the individual than upon the specificity of the irritant. Because of the thick horny layer, the palms and flexor surfaces of the fingers are usually not involved.

Some irritants exhibit distinctive features. Poison ivy, and Japanese and Chinese lacquers, and similar plant irritants produce small and large blisters in groups and in linear arrangement along scratch marks, and an intense edema is often associated with the dermatitis. Inorganic chemicals, especially dye stuffs and solvents, produce diffuse erythema with or without numerous, closely studded, minute thin walled vesicles. Alkalies and solvents produce these latter features in acute cases, and papules, dryness, stiffness and superficial fissuring in chronic cases. In many instances the dermatitis, whatever its type, is confined to circumscribed areas of contact peculiar to the nature of the work.

The Patch Test

IN many cases, the etiology of an occupational dermatitis may be obvious from the history and physical examination but observation of the working environment and activities, if practicable, is always helpful both in determining the causes and in elaborating preventive and treatment measures. In questionable cases special aids such as the patch test are of importance, and they may be carried out in other cases for supportive evidence. But the patch test must not be made the basis of a diagnosis and it must be properly carried out and intelligently interpreted. One of your members, Dr. preted.

Some of the factors that lead to skin sensitization at work and that cannot be duplicated in patch testing are the repeated exposure to the irritant agent over periods of weeks and months and the associated influence of sweating, occupational trauma and other environmental factors during exposure. The epidermal hypersensitivity that has resulted in a contact dermatitis may be confined to the area of dermatitis alone, and a patch test cannot be applied to that site until long after recovery. If the material used in a test is in stronger concentration than in the occupational exposure, or if it is in contact with the skin over a more prolonged period of time, or if the patient has a polyvalent sensitivity, a false interpretation may be placed on a positive reaction. Conversely a false negative test may result. Because of the variation in sensitivity of different areas of skin at the same time, or of an individual site at different times, multiple or repeated patch tests may sometimes be necessary or advisable.

Above all, patch testing should not be done with primary skin irritants but must be confined to those materials that are ordinarily inocuous and to which certain individuals may have developed an intolerance or hypersensitivity. When having this procedure in mind one must also consider testing with materials contacted outside of working hours and testing with the individual components of complex substances. Likewise it is important to know that patients with active or quiescent eczema due to atopy or allergy frequently exhibit a non-specific polyvalent sensitivity. Such individuals may show positive reactions to materials in industry with which they have not come in contact or which have had nothing to do with the development of their eczema or eczematoid dermatitis.

Prevention and Treatment

OCCUPATIONAL skin diseases are to a large extent preventable. Special emphasis should therefore apply to preventive and protective measures. These include improvements in factory and personal hygiene, safety devices, mechanization of hand processes, selective employment, which would exclude the atopic or otherwise hypersensitive individual from certain occupations, and elimination of pronounced primary irritants whenever substitution is possible. Where such measures have been thoroughly carried out some industrial diseases have been completely eliminated and the incidence of others has been materially reduced.

After a thorough investigation of the subject Klauder has expressed the opinion that a toilet soap of good quality properly used, is the most effective and safest cleansing agent. Aside from the degreasing effect of frequent washing, irritation from soap is due to free alkali, notably sodium carbonate. The latter is an irritant in 3 to 10% solution and in ordinary soap solution it is usually in only 1% solution. Abrasive soaps and soap powders, however, are to be looked upon as potential primary irritants because of their high content of free alkaline salts. Where soap must be frequently used it may be followed by the application of a plain cold cream, lanolin, or an olive oil or mineral oil liniment. Specific preventive and protective measures are numerous, and similar to those cited previously for the rubber and cement industries. The application of emollients, such as emulsifying bases containing lanolin or paraffin, before and after work, especially for those exposed to degreasing agents, and of a 2% aqueous solution of hexametaphosphate when oily preparations cannot be used, and the prompt or frequent and complete removal of irritant chemicals, and the observation at all times of scrupulous cleanliness are all of importance. It should be emphasized here that injudicious cleansing is sometimes the cause of more dermatitis than the specific industrial material being removed.

Active treatment procedures include prompt and effective treatment of minor injuries and their continued observation until healed, removal from or protection against further contact with causative agents once dermatitis has developed, and adequate dermatologic treatment. The latter is accomplished best by the dermatologist but can be carried out effectively in many cases by dermatologic consultation, or by a physician experienced in dermatologic procedures.

Much that is of importance in industrial dermatology has not been referred to in this paper and other subjects have been mentioned only briefly, but in emphasizing certain phases of the subject I hope that I have succeeded in clarifying some questions that may have arisen in your individual experiences.

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INDUSTRIAL HYGIENE SECTION

This Industrial Hygiene Section is published to promote sound thought upon and concerning industrial hygiene. To that end it will contain articles, discussions, news items, reports, digests, and other presentations, together with editorial comments. The editorial policy is to encourage frank discussion. On this basis contributions are invited.

Industrial Medicine

Reg. U. S. Pat. Off.

The Editorial Committee will exercise its best judgment in selecting for publication the material which presents most exactly the factors affecting industrial health and developments for control of potentially injurious exposures. The editors may not concur in opinions expressed by the authors but will endeavor to assure authenticity of fact.

The Science, the Law and the Economics of Industrial Health

Volume 1 **JULY, 1940** **Section 3**

CONTENTS

NATIONAL DEFENSE and INDUSTRIAL HYGIENE 41

LEAD POISONING PREVENTION 42
—Available Through Battery Manufacturers

INDUSTRIAL HYGIENE in STEEL PLANT PRACTICE 43
By DONALD E. CUMMINGS

INDUSTRIAL HYGIENE PROCEDURE 45
—For Effective Occupational Disease Control
By H. R. OHLHEISER

TOXICITY of HEAT CONVERTED FILMS of UREA-FORMALDEHYDE-ETHYLENE GLYCOL RESINS TAKEN ORALLY 48
By T. S. HODGINS and A. G. HOVEY

NEW OFFICERS and DIRECTORS 52

MEMBERSHIP INCREASE 52

OFFICIAL PUBLICATION of the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION, WARREN A. COOK, Chicago, Ill., *President;* DONALD E. CUMMINGS, Denver, Colo., *President-Elect;* GORDON C. HARROLD, Detroit, Mich., *Secretary;* THEODORE HATCH, Philadelphia, Pa., *Treasurer.*

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National Defense and Industrial Hygiene

TODAY'S greatest need in the national defense program and that most difficult to provide is adequate supply of experienced and skilled men. Not only must the present force of skilled men actually carry on their work but in addition it is largely their problem to train new recruits for the industrial ranks. The National Defense Advisory Commission has just announced a program for developing additional skilled labor but only with an effective and intensified endeavor to maintain the health of these workers, can the skills of these men be fully productive.

This Commission states that facilities can be made available for training as many as a million and a half people for skilled industrial pursuits. If a program could be developed which would avoid lost time due to illness, both occupational and non-occupational, there would be added immediately to the number of wage earners engaged in manufacturing industries in this country the equivalent of a third of a million men.

No respecter of persons is this despoiler of man power. Key men in a manufacturing operation may be stricken with a disabling illness just as much as less skilled and more easily replaceable workers. And as key men among this group of a third of a million become disabled through illness, they cause reduction in the amount and quality of work of the men left on the job.

Where a tool dresser for a dozen machine operators becomes ill, it is probable that the substitute will not grind and temper the tools as expertly as the regular man with the consequence that the work of the dozen operators will fall below par. Most plants have utility men who can do a variety of jobs, but when certain utility men are laid up, then additional loss of workers in line production may tie up an operation.

Where an operation essential to the manufacture of a product involves an occupational disease exposure, the situation becomes more serious

than the actual number of workers exposed or those actually disabled would indicate. In the first place, as men become affected by excessive exposure to injurious materials, they tend to slow up before they are actually compelled to leave the job. Then as men either become disabled or seek other employment due to a realization that the operation is affecting their health, training of new skilled workers for such an operation becomes a continuous process. The importance of adequate control of potential hazards at such an operation become even more pronounced during times of national emergency.

With accelerated industrial expansion, the application of accepted methods of protection will require more intensive supervision on the part of the industrial hygienist. There will be a tendency to give a maximum of attention to the production unit at the expense of provision of exhaust ventilation or other means of avoiding liberation of injurious materials. It must be emphasized that maximum production from a manufacturing unit depends upon maximum effectiveness of the personnel handling the unit. Provision of proper work environment is accordingly part and parcel of an effective production program.

Numbers of special problems in industrial hygiene will be presented with the speed-up in production in accordance with the needs of national defense. A new worker may find that there is no discomfort if he forgets to wear personal respiratory protective apparatus and consequently removes such protection when he is not under direct supervision. In the training of new workers, the potential hazards should be fully explained and personal control measures followed up. The fact that protection may be necessary even when there may be no immediate discomfort must be emphasized. The attitude should be avoided whereby one of these new workers is led to believe that he will be considered a tenderfoot unless he can tolerate an excessively irritating condition rather than to bring it to the attention of his foreman.

In addition to new workers, there will also be new processes. One plant engaged in the manufacture of mechanical parts for automobile engines with the principal occupational disease that of dermatitis from cutting oils is confronted with the production of these same parts for airplane engines. The increased precision demanded for this new application occasioned by national defense requirements involved the installation of new cleaning and plating processes which introduced occupational disease exposures necessitating special ventilation and procedural measures.

In still other plants, entirely new products will be manufactured. A brass goods manufacturing plant may find mercury compounds must be incorporated in its products with an attendant mercury poisoning hazard.

The speeding up of production will present new problems arising from fatigue, constructive suggestion for which may permit sustained effort throughout the work-day with new production records. Night shifts will be more frequent, presenting problems in illumination.

All this added industrial load will be carried on by industrial workers whose average physical condition will in all probability be at a lower level than that of the present industrial population. This in itself will make the problem of maintenance of health more difficult.

National defense thus presents a challenge to the industrial hygienist to achieve greater effectiveness in the control of industrial health hazards and in the general raising of worker health levels; and at the same time it presents a much more difficult situation under which to reach this higher peak of accomplishment.

Lead Poisoning Prevention

THE report of the proceedings of the Industrial Hygiene Sessions conducted October 24-25, 1939, by the National Battery Manufacturers Association at their 15th Annual Convention in Chicago has been published and is available through them at Akron, Ohio, at $2.00 a copy.

This Association has taken a real lead in sponsoring a study of the lead exposure in the industry by the United States Public Health Service. Following an introduction by MR. L. B. F. RAYCROFT, the President of the Association, in which he includes a concise, yet comprehensive review of the exact situation together with control measures for prevention of poisoning in such a manner as to be the envy of any full time industrial hygienist, there follows a group of papers on various phases of the subject:

"Discussion of Engineering Problems in Lead Hazard" — J. J. BLOOMFIELD.

"Report of Survey of Lead Hazard in the Storage Battery Industry" — W. C. DREESEN, M.D.

"Respirators and Respiratory Protection as Applied to the Lead Battery Industry" — W. P. YANT.

"Engineering Phases of Control of Lead Exposure in Small Battery Plants"—WARREN A. COOK.

"Discussion of Recent Studies with Summary of Analytical Results Correlated with Chemical Data and Suggested Methods of Plant Control" — ROBERT A. KEHOE, M.D.

"Experience with Lead Hazard in a Group of Storage Battery Plants" — W. J. MCCONNELL, M.D.

"Lead Poisoning in Small Battery Operations —CAREY P. MCCORD, M.D.

"Adequate Medical Facilities for Control of Lead Absorption" — E. L. BELKNAP, M.D.

"Case History in Compensation Claim for Lead Poisoning" — C. O. SAPPINGTON, M.D., DR.P.H.

"Control of Lead Hazards" — H. H. VALIQUET.

"Special Medical and Engineering Session"—An informal discussion of the medical and engineering phases of lead hazard and preventive and corrective measures in use in several plants.

This brochure is commended to anyone who may have contact with lead or with control of lead poisoning either from the medical or the engineering point of view.

Industrial Hygiene

—in Steel Plant Practice—

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STEEL—the sprawling giant of heavy industry—consumes with a ravenous appetite a carefully balanced and varied diet of raw materials, digesting its ration with uncouth rumbling and belching, in order to perform an ever more essential and exacting service for man—its pigmy master. Fortune favored this giant during youth so that it grew vigorously and attained full stature without acquiring conspicuous physical defects or incurably chronic diseases. Since reaching maturity, however, occasional deep-seated twinges of pain have induced steel to test the boasted merits of several nostrums until recently it has turned to health insurance, submitting to a thorough examination in order to determine the risk involved. Let us inspect this examination to form an estimate of the proper premium to be charged.

Temperature Effects

STEEL is bothered with several afflictions, the most annoying of which is its fickle temperature. Dublin and Vane have pointed out that iron and steel mill workers are among the first five to seventy-two occupations studied in the order of frequency from influenza, pneumonia and other diseases, of the respiratory system. The United States Public Health Service in Bulletin 202 has estimated that there are nearly 700 more cases of pneumonia each year among iron and steel workers than in an equal number of men employed in other industries. Among occupations involving exposure to inclement weather or wide temperature variations, the frequency of pneumonia is over three times that in trades without this potential hazard. Marked changes in skin temperature produced by exposure to heat or sudden chilling resulting from too rapid evaporation of moisture from the surface of the body tend to predispose steel plant workers employed in the oven section of the coke plant, the casting section of the blast furnace, transportation of molten metal, stove and checker cleaning, open hearth repair, and tending soaking pits, furnaces or rolling mills.

Steel also suffers from several ills induced by excessive radiant energy. Heat exhaustion and heat stroke,—commonplace occurrences of the past, are now becoming so infrequent that they constitute only a potential threat to the present day steel mill worker. Nevertheless, it is well to recall that excessive drinking of alcohol, unusual fatigue, general debility, poor health and old age predispose to these conditions. Heat cramps in fatigued muscles, caused by loss of salt with excessive sweating and by the subsequent drinking of too much water appear most frequently among men of poor physique during the latter part of their working day. Dill has shown that individuals fortunately tend to become acclimatized to hot work by conserving their salt even while sweating freely. Iron and steel workers required to peer at molten or white hot metal also are prone to develop cataracts which appear characteristically in the optical center of the eye at the rear of the lens rather than at the periphery in the form of sectors or radii as noted in senility.

Dusts

THE steel giant has lived so long in an aura of soot and dust that it probably would go unrecognized by old acquaintances if given a clean face. The coke plant smirches its neighborhood with coal, coke and smoke, the sintering plant lies half concealed behind an enveloping cloud of greasy appearing hematite and during a "slip," blast furnaces cough tons of their charge of iron ore, limestone and coke into the surrounding air. In addition, dolomite and fluorspar at the open hearth, lime in the wire mill, coke breeze at the soaking pits, portland cement with the mason gangs and a host of other materials, each contribute their part to the overall dustiness of the steel works. Fortunately, these substances are practically inert when inhaled by workmen and are nuisances rather than serious menaces to health.

Though most of the grime surrounding the steel worker may be regarded with complacence, it must be pointed out that potently hazardous dusts also are encountered in certain parts of the plant. Refractory materials containing considerable proportions of dangerous free silica are widely used in the industry. At the bottom house materials composed almost entirely of free silica such as ganister, sand rock, river sand and broken silica brick are ground dry in large mullers with the production of high dust concentrations. At the open hearth and elsewhere throughout the plant many variations of dusty silica containing brick are unloaded by hand from railroad cars and stored in sheds prior to being used for building and repairing furnaces or for lining ladles. Finely ground dry ganister, fire clay and silica sand, alone and in combination are unloaded by crane from open gondola cars and stored in bins for the preparation of refractory cements or mortars. Laborers tear down highly siliceous open hearth furnaces and checker chambers with dry pneumatic drills and masons rebuild them with dry and dusty silica-containing brick. Laborers and masons are similarly exposed to silica dust in cleaning, repairing or reconstructing blast furnace stoves, the lining of a blast furnace, the refractory portion of power plant boilers, or the furnaces and soaking pits in a rolling mill. Kammer found more than one fourth of a group of steel plant masons were silicotic. The steel plant foundry also offers exposure to silica dust during such operations as sand preparation, shakeout, chipping and the cleaning of castings. Annealing at

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the sheet mill is also accompanied by silica dust evolved from the sand used to seal the trays in which the steel is housed. Men operating cranes in any of the departments which utilize or process silica containing materials are also exposed to a hazard from the fine dust carried to them by the ascending air. These observations indicate that the lungs of the steel giant are undoubtedly pigmented with inert dusts while here and there actual silicotic nodules also may be discerned.

Though steel's accustomed fare consists of carbon and iron it has of late years taken to diet rich in vitamins so that capsules containing copper, chrome, nickel, manganese, molybendum, silicon, lead, vanadium, tungsten, cobalt, zinc, tin, aluminum and many another metal may be found scattered about its habitat. Since some of these metals are poisons, it is apparent that a potential hazard may arise wherever they enter the manufacturing process. Time will not permit a discussion of each of the possible metal poisons but a few of the most interesting may be briefly described. One of the large steel companies recently patented a steel particularly suited to machining and made by adding molten lead directly to molten steel at the ingot mold. Lead fumes are created on the pit side of the open hearth during this operation and later both fumes and dust are evolved at the blooming mills where this steel is rolled. In fact one cannot fully comprehend all of the occupations threatened by this lead-containing product. Red lead is used extensively to spray and paint structural parts in steel mill shops and fabricating plants and molten lead baths serve to anneal steel wire. Lead containing metal is melted, poured and machined to form bearings for rolls and motor and scrap lead is reclaimed by melting in lead recovering furnaces. At each of these operations a potential lead hazard may develop for the steel mill worker.

Occasionally the blast furnace, tired of making pig iron, varies the monotony by turning out ferromanganese. During such periods, employees in this department may inhale the dusts from ores rich in manganese and capable of causing profound injury to the central nervous system. Brass foundry workers, welders and men working in hot galvanizing departments of steel plants have long been familiar with the extremely unpleasant symptoms of metal fume fever induced by the inhalation of freshly generated zinc oxide fumes.

Like most mechanical monsters, steel requires abundant lubrication. Over its articulated framework and into its cavernous belly must flow a never ending stream of oils, cutting compounds, greases and cleaning fluids. Many of these substances tend to dissolve the natural protective film from the workmen's skin, thus rendering it more susceptible to irritation and infection. Dermatitis is therefore commonly encountered wherever steel is machined as in the shops or bolt and nut departments or wherever it is cleaned, as in the pickling process which precedes galvanizing. It may also be recalled that coal tar, one of the materials definitely recognized as predisposing to skin cancer, is produced in large quantities at the steel mill coke plant.

The steel giant does not appear averse to the use of stimulants and, though it favors benzol over alcohol, will take trichlorethylene, carbon tetrachloride or other chlorinated hydrocarbons when offered. Benzol, one of the most hazardous organic solvents, is produced at the coke plant by the distillation of coal tar and enters the working atmosphere of that department at the scrubbers. Much more hazardous, however, are the other steel mill operations where this excellent solvent may find employment as a cleaning agent or vehicle for paints and cements. Certainly the electrical shops may be expected to use benzol and all departments producing painted articles will bear careful scrutiny. Trichlorethylene makes its appearance in the units installed for degreasing steel. This extremely toxic chlorinated hydrocarbon possesses the additional nasty habit of decomposing in an open flame to form phosgene—one of the well known poison gases.

This giant, like those of legend, breathes fire and hot gases. Even though engineers have done much to ensnare the flames, gases and heat of the steel industry, an occasional molecule of carbon monoxide or a stray British Thermal Unit can be found at large around a modern blast furnace. Since carbon monoxide has over 200 times more affinity for hemoglobin than oxygen, concentrations of this gas as small as 0.02% may induce serious symptoms after a few hours continuous exposure. The steel worker is threatened not only with carbon monoxide, which is forever trying to escape its bondage, but also in certain confined areas with gases such as the nitrous oxides or ozone generated by electric arc welding or Cottrell precipitators for removing dust. It is also worthy of note that dangerous concentrations of arsine may be met in cleaning out the sludge from pickling tanks.

Even though steel is huge, it is not a clumsy fellow. The latest report of The National Safety Council shows that the frequency rate for disabling injuries has been reduced to slightly more than six per million man hours—third lowest of all the industries tabulated.

What conclusions may be drawn from the examinations of this giant? It appears to be a hot tempered, though extremely likable, fellow just past the carefree age of youth, still powerfully strong and vigorous but with several early defects and bad habits which, if not soon corrected, may lead to serious trouble—such as an expensive trip to the hospital for the removal of some badly damaged part. It is a grimy, noisy and good natured monster with the hypochondriac's tendency to take any new pills appearing on the market regardless of the state of health enjoyed at the time.

The findings suggest that it would be much more reasonable to place this giant in skilled hands now, in order to assure its continued health, than to await some disabling illness before starting treatment. Every steel mill should have a division of industrial hygiene. This department should include a carefully balanced engineering and medi-

cal personnel working together to detect and control the hazards of the industry. The function of the engineering branch of this partnership should be to determine the degree of exposure to all potential hazards, while the medical section should seek to ascertain the degree of each individual steel mill worker's susceptibility to the threatened dangers. Control of occupational hazards in the steel plant may then be accomplished by either or both of the divisions in this department.

Engineers should calm the volatile temper of the giant with such inducements as properly directed air currents at hot working places, protective screens, suitably selected clothing and carefully tempered showers. Harmful exposure to silica dust or other poisons may be reduced by substituting wet methods for dry, by applying well designed exhaust ventilation or by utilizing personal protective equipment. The engineer also should act as nursemaid and bodyguard, keeping the giant out of too much oil, alkali or acid, noting that it keeps reasonably clean, that it does not go on a benzol or trichlorethylene binge, that it does not venture recklessly into an atmosphere containing poison gases, meanwhile warning it always to remember "safety first."

The physician should give this Gargantua a complete examination at regular intervals in order to warn it of any defects or diseases, so that it may seek treatment before permanent disability is incurred. The physician also should supervise the salt and water intake when the giant's work is hot, should x-ray its chest when exposed to silica, should determine the amount of lead excreted in the urine or the degree of basophilic stippling of red blood cells following contact with this heavy metal, prescribe protective creams when dermatitis is observed, ascertain the proportion of organic and inorganic sulphates in the urine when benzol has been imbibed too freely, discover the degree of saturation of the blood with carbon monoxide after exposure to this gas and constantly guard the giant against contracting infections.

If the suggestions which have been offered are followed, the giant should enjoy a long and healthy life and should be a good risk for health insurance at the normal premium rate.

Industrial Hygiene Procedure

—For Effective Occupational Disease Control—

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THE various phases of industrial hygiene and occupational disease investigations cover a wide field. The most complete and detailed studies require the coordinated efforts of experts in several professions. Examples of such work are the many studies carried out by the United States Public Health Service, such as the investigation made in West Virginia on silicosis and lead poisoning among pottery workers. Personnel of both the Public Health Service and the State Division of Industrial Hygiene cooperated in the work. Scientific workers taking an active part in this study were physicians experienced in occupational diseases, roentgenologists, clinical laboratory technicians, industrial hygienists, chemists, mineralogists, and a technical editor assisted in editing the report. However, such large scale and detailed investigations are usually confined to Federal and state health groups. No doubt, most of you present are primarily interested in one particular company, which, except in a few cases, does not consist of more than one factory.

It is probable that often your first knowledge of an industrial hygiene problem in your particular factory arises when Bill Smith from Department 26 walks into the first aid room or medical department and says, "You know, I don't feel very good. I'm not really sick either, but I don't feel as well as I used to and I've been wondering if that stuff I work with may have a bad effect on me." You know that Bill has worked with this material for two or three years and that others use it in the factory too, but you have heard of no trouble before. It is important at this point of the problem not to permit yourself to get the idea that just because such a condition never has occurred before in your factory, "it can't happen here." Ordinarily you would consider wax to be a harmless material, yet the vapors from some particular types of wax have been proved to be very toxic. One might say a dental laboratory worker could never get silicosis from his work but it actually has happened according to medical findings corroborated by autopsy.

Consequently, the best method to follow is to make a thorough investigation to determine as nearly as possible exactly what the situation is. When faced with a special situation the commander of a military unit makes what is termed an "estimate of the situation." He calls his staff together, outlines the situation and each member, who is a specialist or expert in some particular phase of the miltary establishment, is expected to investigate and report back to the commander who then makes his decision as to the plan of action after considering all of the expert reports. A specific case in industry concerned a gas which was causing irritation to eyes and upper respiratory tract of several workmen. A time was set and the superintendent in charge of production, the medical man, the safety man and the industrial hygiene man all witnessed and discussed the operation as a start of the investigation. It is evident that each of these men has a different point of view but all have the same objective and coordination of effort enhances the possibility of reaching the goal. The logical procedure was then to determine the nature of the gas, the concentration in the workers' breathing zone, and whether

Presented at the Industrial Hygiene Session of the Midwest Safety Conference, at Chicago, May 2, 1940.

under the conditions existing there was a hazard to health. This work requires help from all of those mentioned and possibly others when special examinations or analyses must be made by experts.

Having assembled all this information the "staff" then reports back to the commander, in this case the production superintendent, presents him with the facts and makes suggestions as to what courses may be followed. The superintendent must then make his decision as to the proper action to take.

As the size of an army unit becomes smaller, the number of experts in the commander's staff is reduced until the number may become only one or two. Likewise in industry, in relatively small organizations there may be only one or two to assist the production superintendent. Nevertheless, the same rule should apply. As complete an investigation should be made as possible. It will then be apparent to the superintendent whether or not further facts must be determined. If more information is required, then he must call in expert help from some outside source. In this manner sufficient information is obtained to enable the superintendent to make a wise decision in the course of action to be taken.

In one small plant, the vice-president in direct charge of production operations was apprized of the fact that a rubber cement being used by five women contained benzol as the solvent. The vice-president called the foreman for this group of women and discussed the question with him. There were no others present in the factory having expert knowledge which would have been of assistance in this problem. The vice-president and foreman decided to purchase two or three other types of adhesive for trial, making sure that none of the trial products contained benzol, and soon a satisfactory rubber cement was found. In this case, however, the vice-president was not satisfied since the trial product contained a petroleum distillate and he wished to go even further. Eventually he found an adhesive containing neither benzol nor petroleum distillates, which was perfectly satisfactory for his application, and he has been using that material ever since. This is an example of good industrial hygiene procedure in a small factory.

When an industrial hygiene problem arises then, the plan of action is to make a thorough estimate of the situation and make a decision as to the course to follow in the light of the facts determined. This may seem self-evident but the importance of a careful investigation can be easily overlooked. It is quite possible for a cursory investigation resulting in erroneous conclusions to be more harmful than no investigation.

To determine the facts in a particular problem is not always easy. Many things must be considered and each individual operation in a factory is a problem in itself. Impaired health may, of course, be caused by a non-occupational condition or exposure, but a worker's complaint should not be disregarded on this possibility until an investigation has been made. Just because a given type of operation presents a health hazard in one particular factory, it cannot be assumed that in another factory where conditions are different, the operation is hazardous also. A degreasing operation illustrates this point. In one factory a "homemade" equipment had been constructed for degreasing metal parts using carbon tetrachloride as the solvent. All conditions combined to produce a very real health hazard for men doing this work. Carbon tetrachloride has the lowest boiling point of any of the commonly used chlorinated hydrocarbon degreasing materials and in this case the metal parts were hot when dipped. As a result rapid vaporization of the solvent occurred. No drain racks had been constructed so that liquid solvent was spread over a large area as it drained from the parts which had been placed on a flat table. This, too, was conducive to rapid vaporization. No exhaust ventilation had been installed, and consequently, the vaporized solvent diffused through the general workroom air, exposing the degreasing workman to the greatest concentration and other workers nearby to lower concentrations. On the other hand, many factories use carbon tetrachloride and similar materials in well-designed equipment which accomplishes effective control of the vapors and under such conditions there is but little health hazard. It is not implied that every investigation will require considerable time and painstaking detail. Each case is an individual problem and good judgment must be used in order to determine how much and what kind of information is necessary in order to properly evaluate the hazard.

In the usual investigation the concentration of the potentially hazardous material in the air at the workers' breathing zone is one of the more important facts to be determined. In this field, training and experience are as beneficial to the investigator as in other special fields. There is considerable opportunity for expert judgment as to the methods to be used, number of determinations to be made, time and place of sampling, type of equipment to be utilized in the sampling and in fact, to determine whether or not sampling is necessary.

Methods of dust sampling are quite well established but experience is necessary for accurate enumeration. Analysis to determine the composition of the dust itself requires expert knowledge. Some types of gases and vapors require very technical and elaborate chemical analyses for determination. For several of the gases and vapors, special instruments have been developed to determine concentrations directly by drawing a sample of the air containing the material in question through the instrument. When using even the simplest of these instruments, it is desirable to be as familiar as possible with the details and characteristics of operation. With the MSA Hydrogen Sulphide equipment, directions are given to make ten squeezes of the aspirator bulb, and then make a reading. One might, under some conditions, decide to use 40 squeezes of the bulb and divide the

result by 4, in order to get greater accuracy for low concentrations. However, this procedure would introduce a large factor of error. There is continuous investigation being carried on to develop methods and equipment for sampling. The objects sought in this work are relatively simple methods with sturdy equipment, short analyses with reasonable accuracy and methods that are specific for given materials.

All of the senses of the investigator may be utilized since most of them are useful in the average investigation. The sense of smell is often of especial benefit. The nose is extremely sensitive and numerous gases and vapors may be detected in concentrations less than 1/10 of 1 part per million. Ozone and a large group of sulfur compounds are in this category. Various solvents can sometimes be identified by this sense only, benzol for example. Hydrocyanic acid gas can be judged by some persons more by the sense of taste than by odor.

There are two points which should receive especial emphasis in connection with the sense of smell. First, in accordance with well-recognized physiological laws this sense dulls very rapidly on sustained exposure to an odor. Consequently, the intensity of an odor must be judged when it is first detected. Secondly, caution must be used in the inhalation of the more toxic gases such as hydrocyanic acid and hydrogen sulfide. This is not only because of the extremely toxic nature of these gases but because of the decreasing sensitivity of smell.

Besides concentration values other facts which must be determined when investigating an operation are the total time of exposure in a given period of time, whether the exposure is to high concentrations for short periods of time, to low concentrations for long periods of time, or some combination of the two. Also, the manner in which the operation is carried out by the workman is important. One reason for this is to determine what possible ways the material may enter his body. It must be known, of course, how the material in question can enter the body. Hydrocyanic acid gas, for instance, may be absorbed directly through the unbroken skin. Silicosis results from dust entering the body by inhalation. Several cases of lead poisoning have occurred in children due to ingestion of lead obtained from the paint on toys or on woodwork such as their beds. Sickness from ingestion of toxic materials is not common in industrial workers. Some materials may be absorbed into the body by all three means of entry. For example, lead tetraethyl may be inhaled, absorbed through the skin, or ingested, although only the first two methods are of importance. And finally, medical examination of the persons who perform the operation may give some indication of the degree of hazard existing.

The conditions surrounding each case must determine how much and how detailed the factual information must be. After the necessary facts are obtained and properly correlated, the decision must be made as to whether the operation is hazardous, and, if it is, what action should be taken.

Substitution of a less hazardous material should always be considered, even though it is not frequently applicable. In some cases, where it can be done, it presents a simple solution to the problem. Usually some method of control must be worked out. This often takes the form of properly designed ventilation or exhaust equipment. A general statement can be made to the effect that any material can be safely used by utilizing proper control measures. There are very few exceptions to this rule.

AT THIS point I shall consider a not uncommon problem arising when an investigation of a potentially hazardous operation has been completed. The material in question is known to be toxic in some concentration. The results of the investigation indicate that when considering all factors there is probably no hazard under ordinary conditions but under other conditions there probably is some hazard for varying periods of time. In other words, it is a borderline case. I have intentionally used the word "probably" because in such cases it is absolutely impossible for the industrial hygienist or the physician to say positively and definitely that the worker's health will or will not be harmed some time in the future. When this situation occurs, the question arises as to whether or not an expenditure should be made in order to definitely control the hazard. This is a question which should be faced squarely and if necessary, referred to the management for decision. In such a case, the company policy and general attitude of the management toward the employees usually will decide the issue.

This management problem is not greatly different than some others. For instance, an investigation reveals that by the expenditure of $10,000 for a special machine the company can show a bigger profit on a given product. On the other hand, should the contract for that product be canceled any time within a year after the purchase of the machine, the machine would be useless and would represent a loss to the company. A decision must be made whether or not to buy the machine and problems of this nature containing an element of chance are common in the modern industrial world.

In borderline health hazard cases the element of chance is present also. Most will agree that it would be highly desirable to reduce the potential health hazard to a minimum when considering the worker's point of view. However, aside from that the employer has a good chance of making a profit on his investment which produces cleaner and healthier conditions. Healthy satisfied workers reduce labor turnover and constitute a very valuable asset to any company. Profits from this kind of investment may be somewhat intangible but nevertheless they are very real and many companies are spending large sums of money for improvement of general working conditions.

Up to this point, the procedure described applies to the handling of an industrial hygiene problem which was first learned about by a complaint on

the part of a workman. You will agree, I am sure, that this is not the ideal situation. The ideal way to handle the matter would be for those responsible for the health of employees to initiate a thorough survey of all factory operations, and correct such conditions as were found hazardous before any trouble occurred. Whenever a new operation was to be started, it should be thoroughly investigated from the industrial hygiene angle and any necessary control measures installed at the beginning. In most cases periodic checks must be made to insure that operations are performed in the proper manner as decided on originally and that hazardous materials remain properly controlled. It should be emphasized that industrial hygiene control work is a continuing process. Problems arising because of new materials, new processes and maintenance work require continued effort in order to assure an effective control program.

The New Allison Division Plant of General Motors is an outstanding example of the ideal approach to industrial hygiene problems. The health and the comfort of workmen were considered to be of the greatest importance. Consequently, the factory was planned to include numerous features which would produce the best of working conditions. The factory is completely air-conditioned, artificially lighted and is equipped with ample modern sanitary facilities. Especial attention has been given to dust control equipment and adequate illumination of the best type. Undoubtedly, it was necessary to meet several requirements when consideration was given to the plans for this plant. Nevertheless, it is obvious the management believed that an expenditure of considerable size was warranted for the purpose of obtaining the best working conditions as known today.

Assuming that reasonably effective industrial hygiene procedure exists in your factory, what should you expect as a result? First of all, and of great importance, the worker will benefit by enjoying better health and prolonged working life at higher efficiency. He will be better able to support his immediate family and help others who may depend on him. The employer will benefit by reduced operating expense, less labor turnover, and in many cases, lower direct production costs. Another benefit accruing to the employer is the increased feeling of satisfaction with his job, on the part of the employee. This condition can be of a great deal more importance than it might seem at first thought. The community in which the factory is located will benefit by having healthier and happier workmen in its midst.

In closing, I should like to leave this thought with you. Industrial hygiene and occupational diseases are seldom as dramatic in their action or results as are accidents. Silicosis may be developing in a man over a period of 15 years and during most of that time he may feel no ill effects. Yet, when this man finally experiences a definite advanced stage of silicosis, he is ready for very serious and sometimes dramatic results from both the physical and economic standpoints. Many of the occupational diseases are of this subacute or chronic type and difficult of exact diagnosis. Because of this, there is a tendency to give but scant attention to a workman, not seriously sick, but whose health is below normal as a result of his employment. However, such workers constitute a problem of significant magnitude when consideration is given to the many ramifications of the situation. Therefore, the development of effective industrial hygiene procedure in your factories merits your sincere efforts to the end that your workmen may expect to have as good health and as long a working life as those employed in non-industrial pursuits.

Toxicity

—of Heat-Converted Films of Urea-Formaldehyde-Ethylene Glycol Resins Taken Orally—

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Reichhold Chemicals, Inc.,
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I. INDUSTRIAL USES:

Urea - formaldehyde - ethylene glycol resins have been made for industrial purposes for some time. However, when paper-coating compositions were proposed for grease-resistant wrappers coming in contact with foods such as butter, lard, meat and other fatty substances, it was deemed necessary that toxicity tests be carried out in a manner which would be commensurate with the amount of material which might be consumed orally. Other industrial uses to which these products may be applied are as plywood adhesives, fabric stiffeners, and in combination with rubber latex. In general, these resins, while initially water-soluble, are to be used after application of heat in order that the final film is of an insoluble, infusible gel structure. Resins of this type were described by the authors,[1] emphasizing their stability in solution in storage prior to their use and subsequent conversion by heat to the insoluble, infusible form.

II. RESIN COMPOSITION:

In the preparation of this resin, the following materials are employed:

Aqueous Formaldehyde (37%) (3 mols)	243 parts by wt.
Water	150 parts by wt.
Ethylene Glycol (1 mol)	62 parts by wt.
Urea (1 mol)	60 parts by wt.
Ammonium Hydroxide (26%, Sp.Gr., 0.90)	5 parts by wt.

These are refluxed for 30 minutes at boiling in a glass-lined kettle equipped with a reflux condenser, steam and water jacket, and an agitator. The resulting water-white stable resin solution is then thinned down to 40% non-volatile content with water and cooled to room temperature as rapidly as possible to maintain a low viscosity in order to promote penetrating power. The manufacturer of these resins has been described in several patents by the authors.[2,3,4]

Presented at the First Annual Meeting of the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION, New York, June 4, 1940.

III. General Study of the Problem from the Standpoint of Acute and Chronic Toxicity:

In a study of the toxic properties of a material, it is necessary to take into consideration both acute and chronic toxemia. Therefore, this experiment is divided into two different tests to cover the above factors.

Acute toxemia usually is the result of the ingestion of a single relatively massive dose while chronic toxemia is the result of the ingestion of smaller doses over periods of time. This being the case, it is necessary to include two separate tests, one of which provides for a single massive dose and the second, for smaller doses over a period of time. The relative amounts of the test material fed in each case is governed by a consideration of its chemical and physical characteristics, its intended purpose, as well as any available information on its toxic properties.

Since the product is to be used for waterproofing paper for wrapping foods, and in view of its extremely low solubility, it is improbable that any appreciable amount of the material would contaminate the food or be ingested.

Owing to this factor of low solubility, and the intended use, it was impossible to estimate how much of the material might be ingested in actual practice. Therefore, empirical dosages for both acute and chronic toxicity were used which we believe are many times those which could possibly be consumed under any condition.

Guinea pigs were used for the acute test since they are extremely sensitive to toxic agents. Rats, on the other hand, were chosen for the chronic test because of the similarity of their digestive tract to that of a human and thus they would be comparable to humans on a basis of body weight. Also, by taking two species, information as to possible species differences in sensitivity would be available. The weights of the animals are obtained at the start of the test, and again at the end. Likewise, at the end of the test period, the animals are sacrificed and carefully autopsied for any pathological changes.

Since the sample submitted was a solution containing a solvent which might be toxic, the solvent was evaporated. The residue was dried in the oven at 100° C. until its weight was practically constant. The transparent brittle residue was finely powdered and used in the toxicity tests.

IV. Experimental Data—Part 1:

A group of 10 guinea pigs weighing approximately 300 grams were selected for this experiment to determine the effect of a single relatively massive dose of the test substance.

One hundred milligrams of the material was powdered and fed in 2 grams of the feed per animal. This dose was considered as many times that which could possibly be ingested by a human under actual conditions on an equivalent weight basis. Weights were taken at the start and finish of the test. After holding the animals for 14 days, which period was considered ample for the development of any toxic symptoms, they were sacrificed for any gross pathological changes. Histopathological studies were also made on three representative animals to confirm the gross findings.

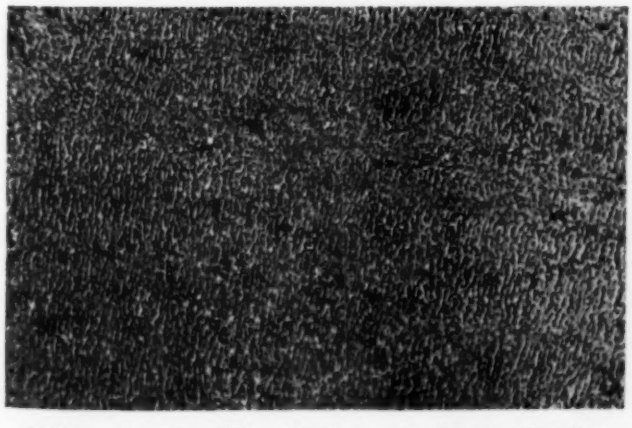
TABLE I
Weights In Grams

Guinea Pig Number	Weight at Beginning	Weight at Sacrifice	Gain or Loss
850	328	358	+30
851	339	342	+ 3
852	310	316	+ 6
853	344	353	+ 9
854	319	347	+28
855	302	328	+26
856	325	370	+45
857	304	349	+45
858	292	337	+45
859	302	329	+27
Average	316.5	342.9	+26.4

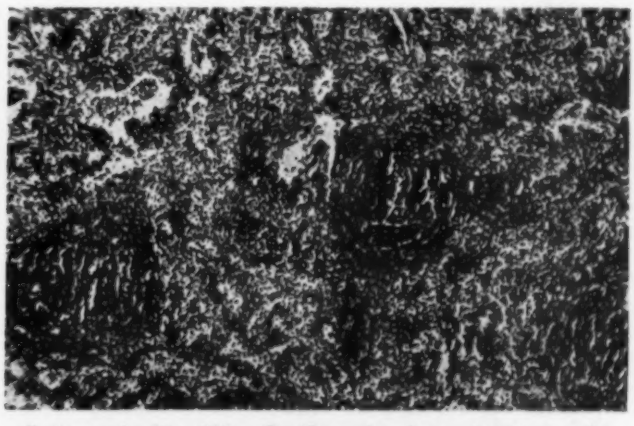
TABLE II
Gross Pathological Observations of Individual Animals Sacrificed at 14 Days

Guinea Pigs

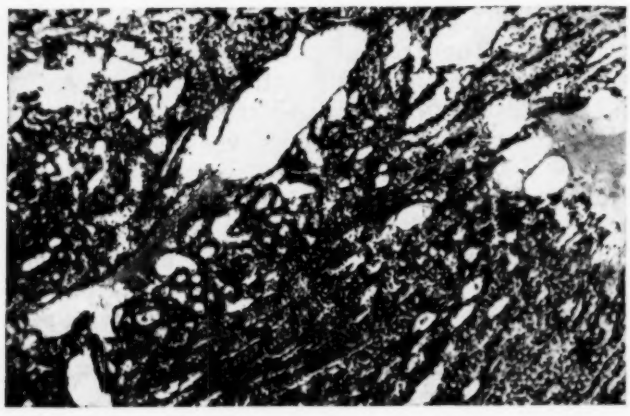
No. 850. Abdominal muscles red. Small amount of visceral fat. Small intestine slightly hyperemic.
No. 851. Abdominal muscles red. Small amount of visceral fat. Small intestine slightly hyperemic.
No. 852. Abdominal muscles slightly red. Small intestine hyperemic.
No. 853. Abdominal muscles somewhat red. Small intestine slightly hyperemic.
No. 854. Abdominal muscles red. Small intestine hyperemic.
No. 855. Abdominal muscles slightly red. Small intestine hyperemic.
No. 856. Abdominal muscles slightly red. Small intestine hyperemic.
No. 857. Normal. No. 858. Normal. No. 859. Normal.



Guinea pig No. 851. Section of adrenal showing normal cellular detail

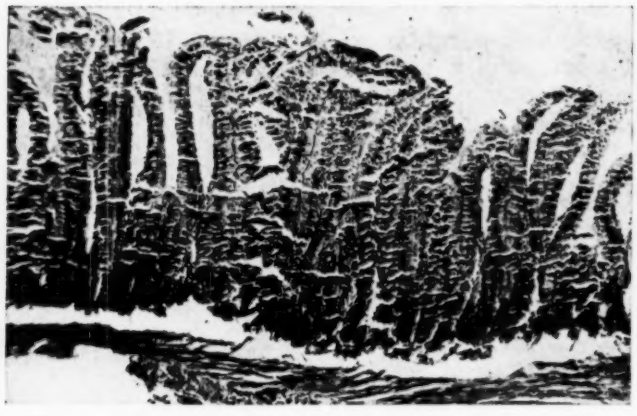


Guinea pig No. 858. Section of spleen showing only normal histological detail



Guinea pig No. 858. Section of kidney revealing normal cytological detail

Guinea pig No. 858. Section of stomach showing mild irritation of the mucosa



Guinea pig No. 858. Section of intestine revealing normal characteristics

Guinea pig No. 858. Section of liver revealing normal cell characteristics

TABLE III

HISTOPATHOLOGY OF REPRESENTATIVE ANIMALS SACRIFICED AT 14 DAYS

GUINEA PIGS

No. 851. LIVER—Kupffer cells active. Vacuolation of the cell cytoplasm.
SPLEEN—Malpighian bodies normally defined. Cellular detail normal.
KIDNEY—Swelling of tubular epithelium and occasional shrinking of the capillary tufts.
GASTRO-INTESTINAL TRACT—No pathology.
ADRENAL—Cellular characteristics normal.

No. 855. LIVER—No pathology.
SPLEEN—Normal cellular detail.
KIDNEY—Normal.
GASTRO-INTESTINAL TRACT—Normal.
ADRENAL—Normal.

No. 858. LIVER—Normal. SPLEEN—No pathology.
KIDNEY—Normal.
GASTRO-INTESTINAL TRACT—Small areas of pseudomembrane formation noted in the stomach.
ADRENAL—Normal.

TABLE IV

SUMMARY OF GROSS AND HISTOPATHOLOGICAL OBSERVATIONS

GUINEA PIGS

Gross observations of the organs of the animals sacrificed at 14 days after receiving the test product showed little significant pathology. The abdominal muscles were red and the small intestine was hyperemic in nearly all animals.

Histopathological studies of the organs revealed vacuolation of the cytoplasm in the liver of one animal. The kidney revealed swelling of the tubular epithelium and shrinking of the capillary tufts in one instance. Slight inflammation of the stomach muscosa was noted in one animal. Diagnosis: No acute toxemia.

PART 2:

A group of 10 rats weighing approximately 200 grams each were selected for this experiment to determine any chronic effects of the test material when fed daily over a period of time. Ten milligrams of the material were dissolved in alcohol and further diluted in orange juice to provide an alcoholic content of not over 30%. Alcohol was necessary as a solvent since the material otherwise would not have gone into solution. Each animal received 0.2 cc. of this solution daily for 30 days. This dosage was considered more than a human could consume under actual conditions on an equivalent weight basis even over a period of time. Weights were taken at the start and again at the end of the experiment.

At the end of 30 days, all the animals were sacrificed and gross autopsies performed to determine any effects of the test material when ingested daily

TABLE I

WEIGHTS IN GRAMS

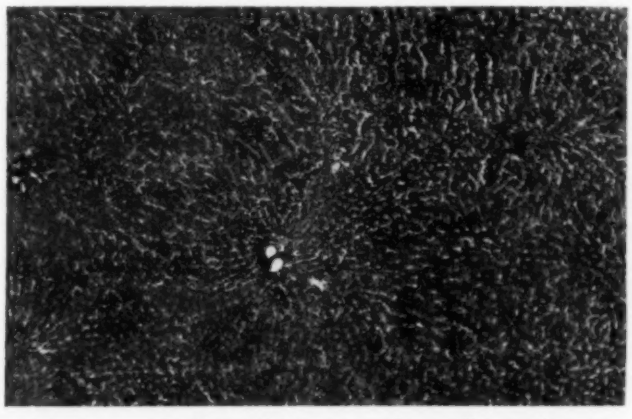
Rat Number	Weight at Beginning	Weight at Sacrifice	Gain or Loss
1	214	240	+26
2	226	247	+21
3	186	186	0
4	206	228	+22
5	185	196	+11
6	187	256	+69
7	214	Died 7th day	
8	223	286	+63
9	224	298	+74
10	197	250	+53
Average	206.2	243.0	+33.9

for such a length of time. Histopathological studies were made on the visceral organs of three representative animals to supplement the gross findings.

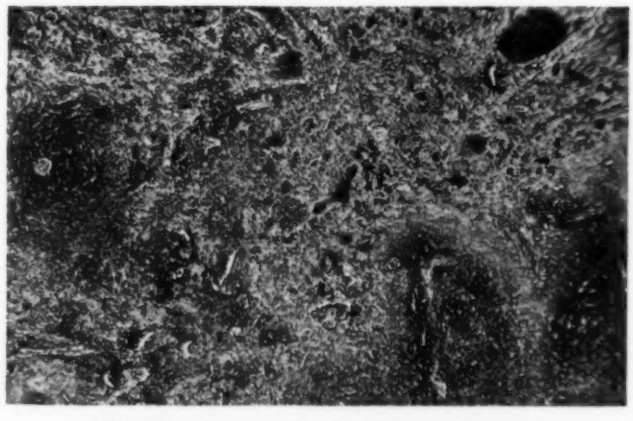
TABLE II
Gross Pathological Observations of Individual Animals Sacrificed at 30 Days

Rats

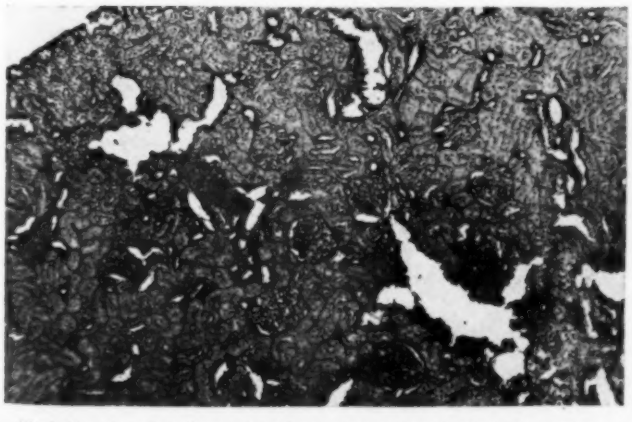
No. 1. No pathology present.
No. 2. No pathology present.
No. 3. All organs normal with the exception of the lungs, which show the presence of pneumonia.
No. 4. Small intestine hyperemic. All other organs reveal normal characterisitcs.
No. 5. Lungs slightly hyperemic.
No. 6. Spleen slightly darker than normal.
No. 8. Spleen dark in color.
No. 9. Abdominal muscles red.
No. 10. Small intestine hyperemic. Kidney slightly swollen with dark cut sections. Lungs congested.



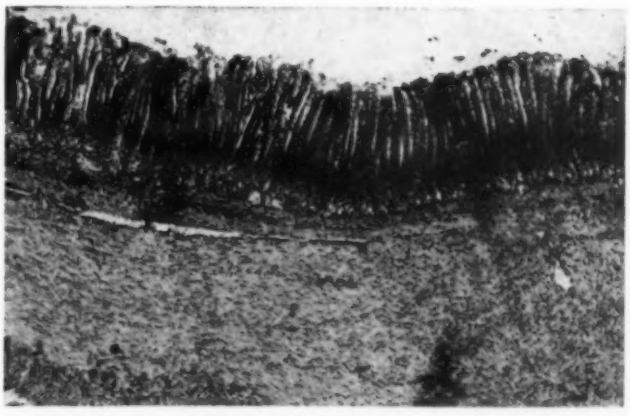
Rat No. 1. Section of liver showing mild confluence of the cell cord cytoplasm



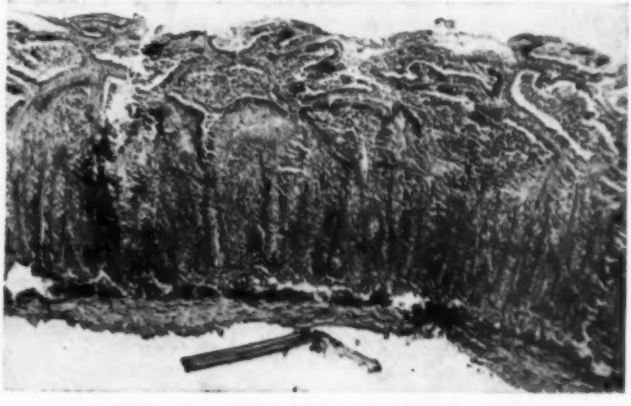
Rat N.o 1. Section of spleen showing pigment deposits



Rat No. 1. Section of kidney showing incipient necrosis of the cortex



Rat No. 1. Section of stomach showing normal detail



Rat No. 1. Section of intestine showing normal detail

TABLE III
Histopathology of Representative Animals Sacrificed at 30 Days

Rats

No. 10. Liver—There is marked confluence of the cell cytoplasm and fading of the nuclei. Kupffer cells are abundant.
Spleen—The Malpighian bodies are poorly defined. There is marked amounts of dark pigment.
Kidney—Areas of glomerular swelling. Cloudy swelling of the convoluted tubules.
Gastro-intestinal tract—Very mild inflammation of the stomach mucosa. There is marked inflammation of the intestinal mucosa.

No. 1. Liver—Mild confluence of the cellular cytoplasm. Kupffer cells noteworthy.
Spleen—The Malpighian bodies are well-defined. Pigment deposits are noteworthy.
Kidney—Incipient necrosis of the cortex evidenced by swelling of the glomeruli and convoluted tubules with marked fading of the nuclei.
Gastro-intestinal tract—The stomach and intestine show normal characteristics.

No. 8. Liver—Confluence of the cell cord cytoplasm. Kupffer cells noteworthy.
Spleen—Malpighian bodies well-defined. Pigment deposits slight.
Kidney—Incipient necrosis of the cortex evidenced by swelling of the convoluted tubules and degeneration of the nuclei as well as merging of the glomeruli with the capsule wall.
Gastro-intestinal tract—The stomach and intestine show only normal characteristics.

No. 3. Liver—Mild confluence of the cell cord cytoplasm.
Spleen—The Malpighian bodies are poorly-defined. A large number of lymphoid cells may be observed.
Kidney—The glomeruli merge with the capsule wall and the convoluted tubules are swollen.
Gastro-intestinal tract—The stomach and intestine show only normal characteristics.

TABLE IV

SUMMARY OF GROSS AND HISTOPATHOLOGICAL OBSERVATIONS

RATS

Gross pathological observations of the organs of rats sacrificed at 30 days showed little significant pathology. Two animals revealed hyperemia of the small intestine. Lung congestion was also observed but this was in all probability not an effect of the material ingested.

Microscopic examinations of the organs revealed confluence of the cellular cytoplasm in the liver. The malipighian bodies of the spleen were poorly-defined in two instances and pigment deposits were present. There was swelling of the convoluted tubules in the kidney and merging of the glomeruli with the capsule wall. In one animals the stomach and intestinal mucosa was inflamed.

Diagnosis: Mild toxemia.

V. DISCUSSION OF RESULTS:

Tests on guinea pigs, in which 100 milligrams of the material were fed in a single relatively massive dose, with their sacrifice 14 days later, showed the material to be non-toxic. This conclusion was based on the gain in weight while on test, their general appearance, and the result of pathological studies following autopsy.

Tests on rats, in which 10 milligrams of the product were fed daily for 30 days, showed from autopsies very little significant toxemia but upon microscopic studies mild gastro-intestinal irritation as well as mild effects upon the liver and kidney could be noted.

However, after careful consideration of the above data, especially in view of the nature of the product, as well as the purpose for which intended, it can be safely concluded that no toxic effects would result from its use in actual practice.

VI. ACKNOWLEDGMENT:

We wish to thank H. Reichhold for kind permission to publish this article, and to acknowledge that the experimental toxicity work was done under the direction of Dr. Harvey A. Seil, of Seil, Putt and Rusby, Inc., of New York.

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2. *Ibid*, U. S. Patent 2,168,477 (Aug. 8, 1939).
3. *Ibid*, British Patent 514,058 (Oct. 30, 1939).
4. *Ibid*, U. S. Patent 2,185,167 (Dec. 26, 1939).

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B-D PRODUCTS
Made for the Profession

BECTON, DICKINSON & CO.
Rutherford, N. J.

SOCIAL SCIENCES

Superior in the PREPARATION OF THE OPERATIVE FIELD

High germicidal properties and great reserve capacity make Mercresin widely applicable whenever an antiseptic is needed. Gram-positive and gram-negative skin bacteria are quickly destroyed; Staphylococcus aureus is killed almost instantly. Mercresin may be diluted with as much as 15 volumes of water without losing its germicidal power against the standard test organism, Staphylococcus aureus; the presence of sodium chloride or serum reduces but does not destroy its activity.

Mercresin presents many advantages in preoperative skin preparation. Since it is appreciably less irritating than official tincture of iodine, capillary permeability is not disturbed, hence extravasation of fluids into surrounding tissues is held to a minimum. Greater skin penetration results in destruction of pathogenic micro-organisms in the deeper layers of the skin.

Mercresin contains 1 part to 1000 each of Mercarbolide and Pentacresol in a vehicle of 50% alcohol, 10% acetone, and 40% water. *Available in 4 ounce, 16 ounce, and gallon bottles in two forms, Tincture Mercresin (Stainless) and Tincture Mercresin (Colored Solution).* The orange dye fades from the skin in a few hours, and is readily removed from sheets by soap and water.

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MERCRESIN

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